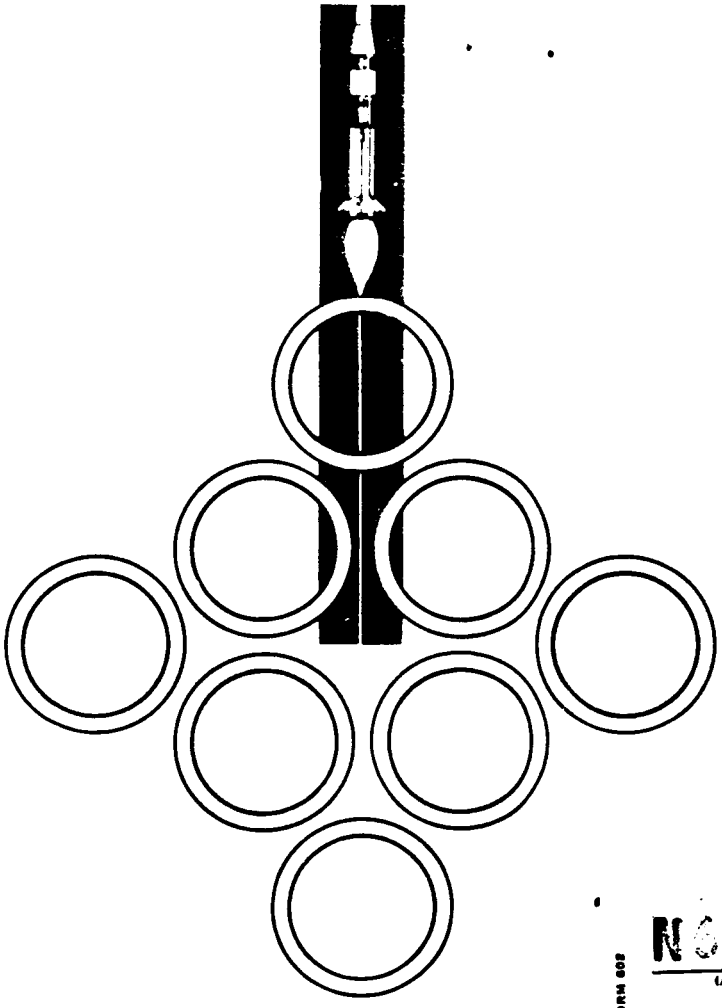

ENGINEERING DEPARTMENT

TECHNICAL REPORT

TR-RE-CCSD-FO-1024-3

January 13, 1967

SATURN IB PROGRAM

TEST REPORT FOR

PNEUMATICALLY OPERATED SHUTOFF VALVE,

6-INCH, 300-PSIG

Parker Aircraft Company Part Number F914-2

NASA Drawing Number 75M13141 LSOV-1

SPACE DIVISION CHRYSLER CORPORATION

TEST REPORT

FOR

PNEUMATICALLY OPERATED

SHUTOFF VALVE, 6-INCH, 300-PSIG

Parker Aircraft Company Part Number F914-2

NASA Drawing Number 75M13141 LSOV-1

ABSTRACT

This report presents the results of the tests performed on two specimens of Pneumatically Operated Shutoff Valve 75M13141 LSOV-1. The following tests were performed on each test specimen:

1. Receiving Inspection
2. Proof Pressure
3. Functional
4. Temperature Shock
5. Surge
6. Icing
7. Cycle
8. Burst

The specimen performance was in accordance with drawing 75M13141 LSOV-1 with the exception of seat leakage.

During the initial functional test, the seat leakage rate, while the specimen was pressurized to 300 psig with LN_2, was 416 sccm for specimen 1 and 333 sccm for specimen 2. The leakage rates were close to the maximum allowable leakage rate of 300 sccm and are therefore not considered detrimental to valve operation.

During subsequent functional tests, the GN_2 leakage rate was greater than the specified maximum of 6 sccm whenever the temperature of the specimens was below room temperature.

An additional test, not required by TP-RE-CCSD-FO-1024-2R, was performed to determine the GN_2 leakage rates at pressures below 300 psig. The description and results of this test are presented in appendix A.

TEST REPORT

FOR

PNEUMATICALLY OPERATED SHUTOFF VALVE

6-INCH, 300-PSIG

Parker Aircraft Company Part Number F914-2

NASA Drawing Number 75M13141 LSOV-1

January 13, 1967

CHRYSLER CORPORATION SPACE DIVISION - NEW ORLEANS, LOUISIANA

FOREWORD

The tests reported herein were conducted for the John F. Kennedy Space Center by Chrysler Corporation Space Division (CCSD), New Orleans, Louisiana. This document was prepared by CCSD under contract NAS8-4016, Part VII, CWO 271620.

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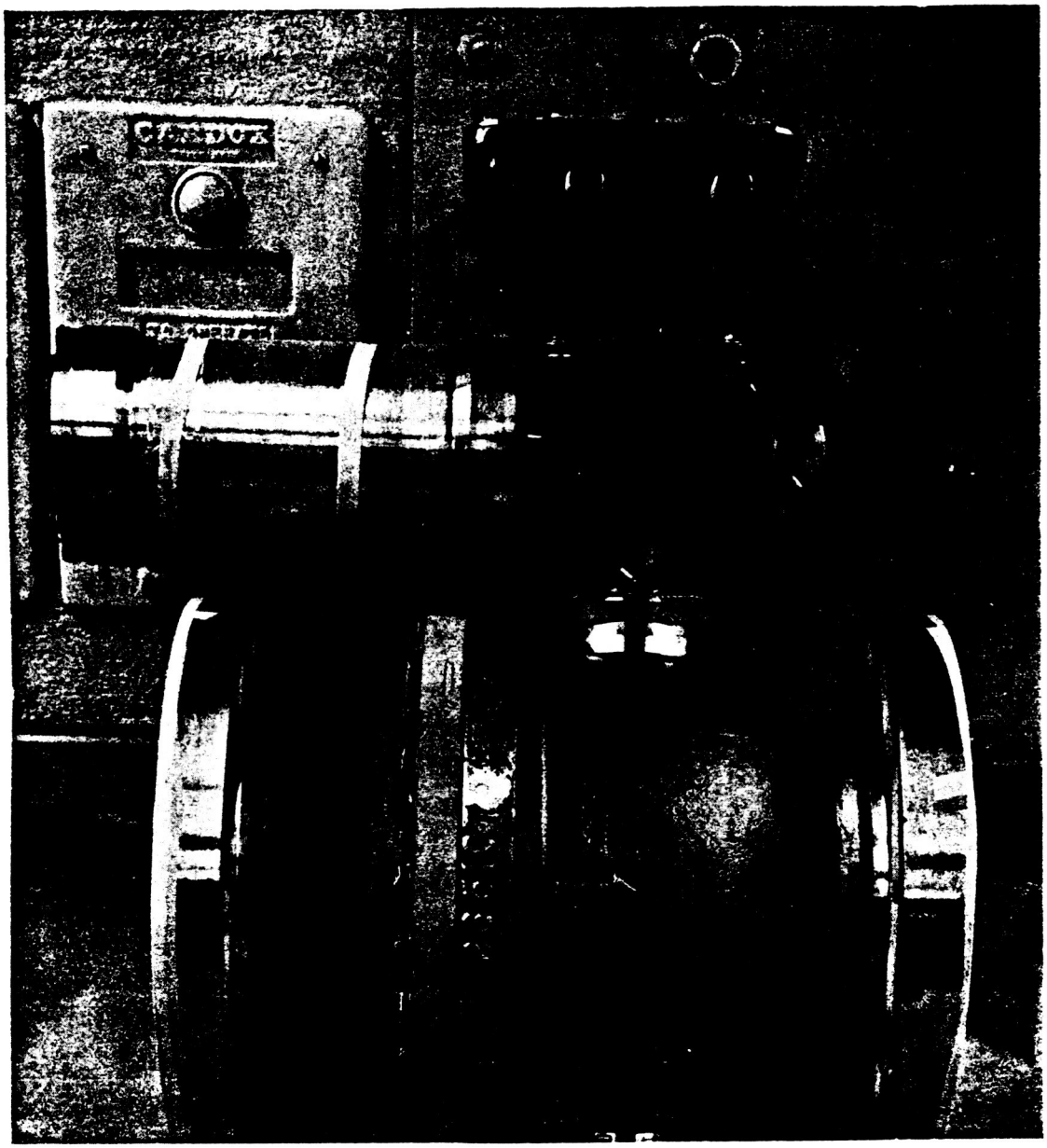


Pneumatically Operated Shutoff Valve 75M13141,
6-Inch, 300-psig

CHECK SHEET

FOR

PNEUMATICALLY OPERATED SHUTOFF VALVE, 6-INCH, 300-PSIG;

MANUFACTURER; Parker Aircraft Company, Los Angeles, California
MANUFACTURER'S PART NUMBER: F914-2
NASA DRAWING NUMBER: 75M13141 LSOV-1
TESTING AGENCY: Chrysler Corporation Space Division, New Orleans, Louisiana
AUTHORIZING AGENCY: NASA KSC

I. FUNCTIONAL REQUIREMENTS

A.	OPERATING MEDIUM:	Valve - Liquid or gaseous oxygen Actuator - Gaseous nitrogen
B.	OPERATING PRESSURE:	Valve - 300 psig Actuator - 750 psig
C.	VALVE CAPACITY:	C_v - Minimum of 1600
D.	VALVE LEAKAGE:	Internal - 6 sccm maximum at ambient temperature External - None
E.	VALVE OPERATION:	Spring-to-open actuator

II. CONSTRUCTION

A.	MATERIAL:	Metal parts in flow stream are stainless steel; nonmetallic parts in flow stream are Teflon.

III. ENVIRONMENTAL REQUIREMENTS

A.	OPERATING TEMPERATURE RANGE:	Actuator - 0 to + 125°F Valve - 320 to + 125°F

IV. LOCATION AND USE: Used in the liquid oxygen storage system as the main vent valve.

TEST SUMMARY

Pneumatically Operated Shutoff Valve, 6-Inch, 300-psig

Environment	Units	Operational Boundary	Test Objective	Test Results	Remarks
Receiving Inspection	2	Compliance with NASA and vendor [illegible] drawings	Check for conformance with NASA and vendor drawings	Satisfactory	No evidence of poor workmanship or manufacturing defects
Proof Pressure		Valve: 450 psig Actuator: 1125 psig	Check for leakage and distortion	Satisfactory	No leakage or distortion
Functional Test	2	Valve: 300 psig GH_2, LH_2 Actuator: 750 and 800 psig	Check for seat leakage with GH_2 and LH_2 at 300 psig Check valve opening and closing times		Leakage with LH_2 at 300 psig was 416 sccm for specimen 1 and 333 sccm for specimen 2 All opening and closing times were satisfactory
Temperature Shock	2	+125 to -320°F	Determine if specimen operation is impaired by temperature shock		Leakage following temperature shock was 133 sccm for specimen 1 and 833 sccm for specimen 2
Surge	2	0 to 300 psig in 100 ms	Determine if specimen operation is impaired by surge	Satisfactory	Specimens 1 and 2 withstood 1000 pressure surges
Icing	2	$\frac{1}{2}$-inch ice at 5°F	Determine if specimen operation is impaired by icing		Leakage during icing test was 50 sccm for specimen 1 and 83.3 sccm for specimen 2
Life Cycle	2	1000 cycles	Determine if specimen operation is impaired by cycling	Satisfactory	Leakage rates for specimens 1 and 2 were above 100 sccm after 100 and 500 cycles Leakage rate was 0 sccm following 100 cycles
Burst	2			Satisfactory	No rupture or distortion

SECTION I

INTRODUCTION

1.1 SCOPE

This report presents the results of tests performed to determine if pneumatically operated Shutoff Valve 75M13141 LSOV-1 meets the operational requirements for John F. Kennedy Space Center Launch Complexes 34 and 37B. A summary of the test results is presented on page viii.

1.2 ITEM DESCRIPTION

1.2.1 Two specimens of Pneumatically Operated Shutoff Valve 75M13141 LSOV-1 were tested.

1.2.2 The valve is a 6-inch valve with 300-pound raised face flanges. It is used as the liquid oxygen storage main vent valve. The valve is 16-3/32 inches face-to-face and is approximately 26 inches from the bottom of the flange to the top of the position-indicating-switch housing. The valve is a pneumatically operated, ball-rotor, unidirectional shutoff valve with split body design. Rotation of the ball in the flow stream is provided by an enclosed pneumatic actuator and linkage mechanism mounted directly above the valve and parallel to the flow stream. When in the open position, the valve provides a straight-through flow path for the valve media. Internal sealing of the ball in the flow stream is accomplished by a spring-loaded circular Teflon seal. Minimum C_v for this valve is 1600. The normal operating medium is gaseous or liquid oxygen for the valve and gaseous nitrogen for the actuator. The actuator is the spring-to-open type which opens in case of loss of the operating pressure to the actuator. Two explosion-proof snap action limit switches, enclosed in an additional weather and sandproof housing, are incorporated for valve position indication (open or closed).

1.3 APPLICABLE DOCUMENTS

The following documents contain the test requirements for Pneumatically Operated Shutoff Valve 75M13141 LSOV-1.

a. KSC-STD-164(D), Standard Environmental Test Methods for Ground Support Equipment Installations at Cape Kennedy

b. Drawing 75M13141 LSOV-1, Valve, Shutoff, Pneumatically Operated, 6-inch, 300-psig

c. Cleanliness Standard MSFC-SPEC-164

d. Test Plan CCSD-FO-1024-1R

e. Test Procedure TP-RE-FO1024-2R

SECTION II

RECEIVING INSPECTION

2.1 TEST REQUIREMENTS

The specimen shall be visually and dimensionally inspected for conformance with the applicable specifications prior to testing.

2.2 TEST PROCEDURE

A visual and dimensional inspection was performed to determine specimen compliance with NASA drawing 75M13141 LSOV-1 and Parker Aircraft Company drawing number F914-2 to the extent possible without disassembling the test specimens. At the same time the test specimens were also inspected for poor workmanship and manufacturing defects.

2.3 TEST RESULTS

The specimen complied with NASA drawing 75M13141 LSOV-1 and Parker Aircraft Company drawing number F914-2. No evidence of poor workmanship or manufacturing defects was observed.

2.4 TEST DATA

The data presented in table 2-1 were recorded during the receiving inspection.

Table 2-1. Specimen Specifics

Name	Parker Aircraft Co. Pneumatically Operated Shutoff Valve
Type	Normally Open
Parker P/N	F914-2
Parker S/N	203 (Specimen 1)
	204 (Specimen 2)
Customer No.	LSOV-1
Service Fluid	LOX
Operating Pressure Valve	300 psig
Actuator	750 psig
Customer Specification	75M13141

Table 2-1. Specimen Specifics (Continued)

Length	16.1 inches
Height	22.75 inches
Inside Diameter	6.07 inches
End Connections	6-inch 300 lb ASA flanges

SECTION III

PROOF PRESSURE TEST

3.1 TEST REQUIREMENTS

3.1.1 Each valve shall be pressurized with GN_2 to the proof pressure of 450 psig. This pressure shall be maintained for 5 minutes and the valve shall be checked for external leakage and distortion.

3.1.2 Each actuator shall be pressurized to the proof pressure of 1125 psig. This pressure shall be maintained for 5 minutes and the actuator shall be checked for external leakage and distortion.

3.2 TEST PROCEDURE

3.2.1 The test specimen was installed as shown in figures 3-1 and 3-2 using the equipment listed in table 3-1.

3.2.2 All hand valves, solenoid valves, and pressure regulator were closed.

3.2.3 Hand valves 3, 5, and 8 were opened and the 3200-psig GN_2 supply pressure was monitored on pressure gage 6.

3.2.4 The outlet of solenoid valve 15 was connected to port 16. Solenoid valve 15 and hand valve 11 were opened.

3.2.5 Actuator port A was pressurized to 1125 psig by adjusting regulator 9. Actuator pressure was monitored on pressure gage 10.

3.2.6 Solenoid valve 15 was closed and leakage from the specimen was checked for 5 minutes by observing pressure gage 10 for an indication of a drop in actuator pressure. The pressure at the start and at the completion of the 5-minute period was recorded.

3.2.7 Solenoid valve 15 was opened. Actuator pressure was vented to 750 psig through regulator 9. Solenoid valves 12 and 13 were actuated.

3.2.8 Actuator port B was pressurized to 1125 psig by adjusting regulator 9. Actuator pressure was monitored on pressure gage 10.

3.2.9 Solenoid valve 15 was closed, and the specimen was checked for leakage for 5 minutes by observing pressure gage 10 for an indication of a drop in actuator pressure. The pressure at the start and at the completion of the 5 minute period was recorded.

3.2.10 Solenoid valve 15 was opened and actuator pressure was vented completely through regulator 9. The outlet of solenoid valve 15 was disconnected from port 16 and connected to port 17.

3.2.11 The valve section of the specimen was pressurized to 450 psig by adjusting regulator 9. The specimen pressure was monitored on pressure gage 14.

3.2.12 Solenoid valve 15 was closed and the specimen was checked for leakage for 5 minutes by observing pressure gage 14 for an indication of a drop in pressure. The pressure at the start and at the completion of the 5-minute period was recorded.

3.2.13 Solenoid valve 15 was opened and the pressure was completely vented from the specimen through regulator 9.

3.2.14 The actuator and valve sections of the specimen were examined for distortion.

3.3 TEST RESULTS

There was no leakage from either specimen during proof pressure testing and no evidence of distortion.

3.4 TEST DATA

The data presented in table 3-2 were recorded during the test.

Table 3-1. Proof Pressure Test Equipment List

Item No.	Item	Manufacturer	Model/ Part No.	Serial No.	Remarks
1	Test Specimen	Parker Aircraft	F914-2	203 and 204	Pneumatically operated shut-off valve
2	GN_2 Source	N/A	N/A	N/A	3200-psig
3	Hand Valve	Combination Pump Valve Company	130P5	N/A	1-inch
4	Filter	Bendix Corp. Filter Division	2-S-13460-16-B-0	N/A	2-micron
5	Hand Valve	Robbins Aviation	TT-180	N/A	½-inch
6	Pressure Gage	Acco Helicoid	N/A	08-113 200577-AA	0-to 5000-psig ±1.0% FS accuracy Cal. date 8-16-66
7	Hand Valve	Robbins Aviation	TT-180	N/A	½-inch
8	Hand Valve	Robbins Aviation	TT-180	N/A	½-inch
9	Regulator	Grove Valve and Regulator Co.	18	N/A	0-to 6000-psig inlet 0-to 6000-psig outlet
10	Pressure Gage	Seegers Instrument Co.	2122-11	08-113 200577-F	0-to 1000-psig ±0.1% FS accuracy Cal. date 9-16-66
11	Hand Valve	Robbins Aviation	SSKA 250-4T	N/A	¼-inch
12	Solenoid Valve	Marotta Valve Co.	MV-74	N/A	¼-inch 3-way, NC
13	Solenoid Valve	Marotta Valve Co.	MV-74	N/A	½-inch 3-way, NC

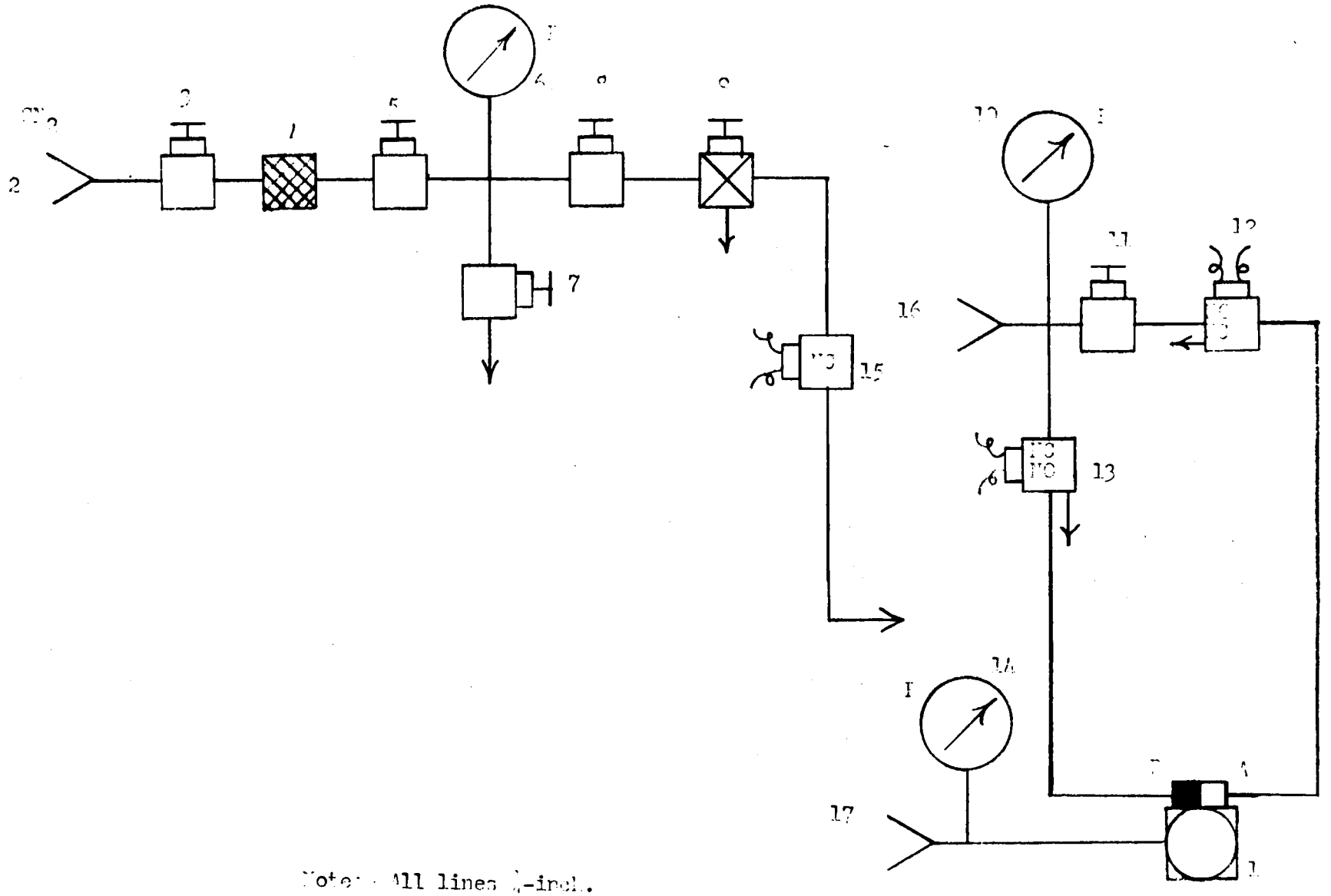
Table 3-1. Proof Pressure Test Equipment List (Continued)

Item No.	Item	Manufacturer	Model/ Part No.	Serial No.	Remarks
14	Pressure Gage	Seegers Instrument Company	2122-25	08-113 200577-0	0-to 4000-psig ±0.1% FS accuracy Cal. date 9-16-66
15	Solenoid Valve	Marotta Valve Co.	MV-510M	N/A	½-inch, 2-way
16	Port	N/A	N/A	N/A	¼-inch,
17	Port	N/A	N/A	N/A	¼-inch

Note: Manufacturer, Model/Part Number, and Serial Number columns shall be completed during the test.

Table 3-2. Proof Pressure Test Data

	Initial Pressure (psig)	Pressure After 5 Minutes (psig)	Leakage	Distortion
Valve	450	450	None	None
Actuator Port A	1125	1125	None	None
Actuator Port B	1125	1125	None	None



Note: All lines ¼-inch.
Refer to table 3-1 for item identification.

Figure 3-1. Proof Pressure Test Schematic

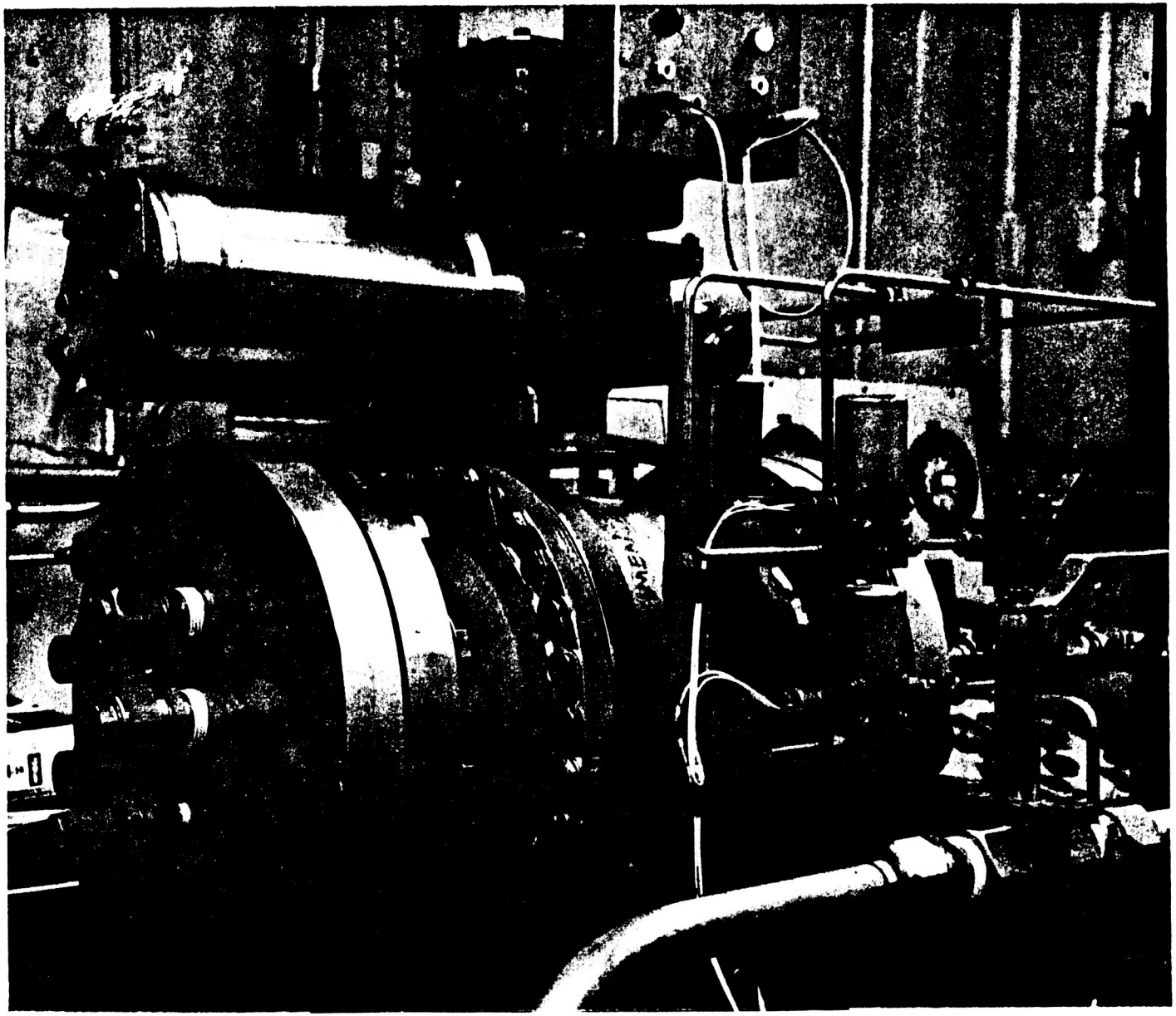


Figure 3-2. Proof Pressure Test Setup

SECTION IV

FUNCTIONAL TEST

4.1 TEST REQUIREMENTS

4.1.1 GENERAL

4.1.1.1 Position-Indicating Switches. The position-indicating switches shall be monitored during each step of the functional test.

4.1.1.2 External Leakage. The valve shall be checked for external leakage with a leakage check solution during the functional test or visually when temperatures are below the freezing point of the leakage check solution.

4.1.1.3 GN_2 leakage shall be measured by water displacement method at ambient temperature and by the flowmeter at cryogenic temperatures.

4.1.2 CYCLING

4.1.2.1 The valve shall be pneumatically cycled 10 times with 750-psig GN_2 from the opened to the closed to the opened positions. Cycling shall be performed during the initial functional test only.

4.1.3 VALVE INTERNAL SEAT LEAKAGE

4.1.3.1 The valve shall be held in the closed position with 750-psig GN_2 on the actuator and the valve shall be pressurized to 300 psig with GN_2 at ambient temperature on the upstream side. The valve shall be checked for leakage for 5 minutes. Maximum allowable leakage is 6 sccm. During the initial functional test only, the leakage test shall be repeated using LN_2 as the test medium. The maximum leakage allowed with LN_2 is 300 sccm.

4.1.4 VALVE OPENING (NORMAL)

4.1.4.1 The valve shall be closed by pressurizing the actuator with 750-psig GN_2. The valve shall be pressurized to 300 psig with GN_2 at ambient temperature on the upstream side. The valve shall be opened by pressurizing the actuator with 750-psig GN_2 and the response speed shall be measured. During the initial functional test only, the valve opening test shall be repeated using LN_2 as the test medium. The maximum required response time from fully closed to fully open is 2 seconds.

4.1.4.2 Repeat the procedures in 4.1.4.1 using 800-psig GN_2 as the actuating pressure during the initial functional test only.

4.1.5 VALVE CLOSING

4.1.5.1 Hold the valve in its normally opened position by pressurizing the actuator with 750-psig GN_2. The valve shall be pressurized

to 300 psig with GN_2 at ambient temperature on the upstream side. The valve shall be closed by pressurizing the actuator with 750-psig GN_2 and the response speed shall be measured. During the initial functional test only, the valve closing test shall be repeated using LN_2 as the test medium. The maximum required response time from fully open to fully closed is 2 seconds.

4.1.5.2 Repeat the procedures in 4.1.5.1 using 800-psig GN_2 as the actuating pressure during the initial functional test only.

4.1.6 VALVE OPENING (LOSS OF ACTUATOR PRESSURE)

The valve shall be closed by pressurizing the actuator with GN_2 to 750 psig. The valve shall be pressurized to 300 psig with LN_2. A loss of actuator pressure shall be simulated by venting the actuator and the response speed shall be measured. This test shall be performed during the initial functional test only.

4.1.7 The insulation resistance and leakage current between all non-connected terminals and between each terminal and the case shall be measured. The minimum allowable insulation resistance required shall be 20 megohms and the maximum allowable leakage current shall be 2 milliamperes. Measurements shall be made using an applied voltage of 500 vdc for a minimum of 60 seconds. This test shall be performed during the initial functional test, the icing test, and the last functional test during cycling only.

4.2 TEST PROCEDURE

4.2.1 The specimen was installed as shown in figure 4-1 using the equipment listed in table 4-1.

4.2.2 All hand valves, solenoid valves and pressure regulators were closed.

4.2.3 Hand valves 3, 6, and 9 were opened and the 3200-psig supply pressure was monitored on pressure gage 5.

4.2.4 Hand valve 12 was opened and actuator port A was pressurized to 750 psig by adjusting regulator 7. Actuator pressure was monitored on pressure gage 11.

4.2.5 The specimen was opened and closed 10 times by simultaneously actuating and deactuating solenoid valves 13 and 14. Limit switch operation and valve position were monitored with indicator lights 18.

4.2.6 The specimen was closed by actuating solenoid valves 13 and 14. The valve was pressurized to 300 psig by adjusting regulator 10. Valve pressure was monitored on pressure gage 15.

4.2.7 Flowmeter 16 was connected to the outlet of hand valve 20 and hand valve 20 was opened. Seat leakage was checked for 5 minutes by observing flowmeter 16.

4.2.8 Hand valve 20 was closed and flowmeter 16 was disconnected.

4.2.9 The specimen was opened by simultaneously deactuating solenoid valves 13 and 14. The time between limit switch actuations was measured by timer 19 and recorded as the opening time.

4.2.10 The specimen was closed by simultaneously actuating solenoid valves 13 and 14. The time between limit switch actuations was measured by timer 19 and recorded as the closing time.

4.2.11 The actuator pressure was increased to 800 psig by adjusting regulator 7. The procedures described in paragraphs 4.2.9 and 4.2.10 were repeated while the actuator was pressurized to 800 psig.

4.2.12 The actuator pressure was reduced to 750 psig and the specimen was opened by simultaneously deactuating solenoid valves 13 and 14. Valve pressure was vented through regulator 10.

4.2.13 The specimen was installed as shown in figures 4-2 and 4-3. Valves 21, 27, 31, and 28 were opened. Pump 23 was started. The actuator system was not changed for this procedure.

4.2.14 The specimen was pressurized to 300 psig by adjusting hand valve 31. Specimen pressure was monitored on gage 15.

4.2.15 When the specimen was filled with LN_2, flowmeter 35 was connected to the outlet of hand valve 20 and hand valve 20 was opened. Leakage was checked for 5 minutes by observing flowmeter 35. Flowmeter gas temperature was monitored on thermometer 34 and recorded.

4.2.16 Hand valve 20 was closed and flowmeter 35 was disconnected.

4.2.17 The procedures described in paragraphs 4.2.9 through 4.2.11 were performed.

4.2.18 After determining the closing time at an actuator pressure of 800 psig, the valve was held in the closed position and hand valve 20 was opened. The actuator pressure was reduced to 750 psig.

4.2.19 A loss of actuator pressure was simulated by closing hand valve 12 and then deactuating solenoid valves 13 and 14.

4.2.20 The time between limit switch actuations was measured with timer 19. This time was recorded as opening time in the event of an actuator pressure loss.

4.2.21 The insulation resistance between all non-connected terminals and between each terminal and the case was measured. The minimum insulation resistance required is 20 megohms. A voltage of 500 vdc was used as the test voltage. This voltage was applied for a minimum of 60 seconds. The insulation resistance was above the required minimum.

4.2.22 Only the tests described in 4.2.23 through 4.2.25 were performed for subsequent functional tests, unless otherwise specified.

4.2.23 Seat leakage was measured and recorded as described in paragraphs 4.2.6 through 4.2.8.

4.2.24 The specimen opening time was measured and recorded as described in paragraphs 4.2.6 and 4.2.9.

4.2.25 Following the determination of the opening time, the closing time was measured and recorded as described in paragraphs 4.2.10.

4.3 TEST RESULTS

4.3.1 Seat leakage, measured for specimens 1 and 2, while the specimens were pressurized with LN_2 to 300 psig was above the minimum requirement of 300 sccm. Other functional test results for specimens 1 and 2 were satisfactory.

4.4 TEST DATA

The data presented in table 4-2 were recorded during the initial functional test.

Table 4-1. Functional Test Equipment List (Sheet 1 of 3)

Item No.	Item	Manufacturer	Model/ Part No.	Serial No.	Remarks
1	Test Specimen	Parker Aircraft Company	F914-2	203 and 204	Pneumatically operated shut-off valve
2	GH_2 Source	N/A	N/A	N/A	3200-psig
3	Hand Valve	Combination Pump Valve Company	130P5	N/A	1-inch
4	Filter	Bendix Corp. Filter Div.	2-S-134-60 16-B-0	N/A	2-micron
5	Pressure Gage	Acco Helicoid	N/A	08-113-200577-AA	0- to 5000-psig ±1.0% FS accuracy Cal. Cal. date 8-16-66
6	Hand Valve	Robbins Aviation	TT-180	N/A	½-inch
7	Pressure Regulator	Grove Valve and Regulator Company	18	N/A	0-to 6000-psig inlet 0-to 6000-psig outlet
8	Hand Valve	Robbins Aviation	TT-180	N/A	½-inch
9	Hand Valve	Robbins Aviation	TT-180	N/A	½-inch
10	Pressure Regulator	Grove Valve and Regulator Co.	18	N/A	0-to 6000-psig inlet 0-to 6000-psig outlet
11	Pressure Gage	Seegers Instrument Co.	2122-25	08-113-200577-G	0-to 4000-psig ±0.1% FS accuracy Cal. date 9-16-66
12	Hand Valve	Robbins Aviation	SSKA-250-4T	N/A	¼-inch
13	Solenoid Valve	Marotta Valve Co.	MV-74	N/A	¼-inch 3-way, NO

Table 4-1. Functional Test Equipment List (Sheet 2 of 3)

Item No.	Item	Manufacturer	Model/ Part No.	Serial No.	Remarks
14	Solenoid Valve	Marotta Valve Co.	MV-74	N/A	¼-inch 3-way, NC
15	Pressure Gage	Seegers Instrument Company	2122-11	08-113 200577-F	0-to 1000-psig ±0.1% FS accuracy Cal. date 9-16-66
16	Flowmeter	Fischer-Porter Co.	N/A	08-113-200595F	Cal. date 10-26-66
17	Power Supply	Perkin Co.	MRST-28-300A	N/A	28-vdc
18	Indicator Lights	General Electric	N/A	N/A	28-volt
19	Timer	Computer Measurements Co.	726B	08-113-017542	Cal. date 6-9-66
20	Hand Valve	Flowmatics Incorporated	MBL-715-19	N/A	1-inch ball valve
21	Hand Valve	Hills-McCanna	N/A	N/A	1-inch
22	Pressure Gauge	Ashcroft	N/A	08-113-200507-I	0-to 400-psig Cal. date 9-16-66
23	LN_2 Pump	Cosmodyne	N/A	1	0-to 1500-psig
24	Pressure Gage	Ashcroft	N/A	08-113 200507-P	0-to 3000-psig ±1.0% FS accuracy Cal. date 9-16-66
25	Filter	Puroflo	3258	N/A	10-micron
26	Pneumatically Operated Valve	Research Controls	21388	N/A	1-inch
27	Pneumatically Operated Valve	Research Controls	21388	N/A	1-inch

Table 4-1. Functional Test Equipment List (Sheet 3 of 3)

Item No.	Item	Manufacturer	Model/ Part No.	Serial No.	Remarks
28	Hand Valve	Hills-McCanna	N/A	N/A	1-inch ball valve
29	Filter	Puroflo	3258	N/A	10-micron
30	Pressure Gage	Ashcroft	N/A	08-113-200507-0	0-to 500-psig ±1.0% FS accuracy Cal. date 9-16-66
31	Hand Valve	Flow Matics Incorporated	MBL-715-19	N/A	1-inch ball valve
32	Thermometer	Honeywell	N/A	N/A	Thermocouple ± 2°F
33	Relief Valve	Anderson Greenwood	3TS44-2	N/A	320-psig
34	Thermometer	Honeywell	N/A	N/A	Thermocouple ± 2°F
35	Flowmeter	Fischer Porter Co.	N/A	08-113-200595-E	Cal. date 10-26-66
36	Insulation Resistance Tester	General Radio Co.	1862C	08-113-018416	Cal. date 8-9-66
37	LN_2 Tank	Cosmodyne	N/A	N/A	250-gal.
38	Temperature Chamber	CCSD	N/A	N/A	Temperature shock test only
39	Thermotron	Thermotron Co.	N/A	08-113-200895-13	Temperature shock test only
40	Icing Chamber	CCSD	N/A	N/A	As specified in KSC-STD-164-D (icing test only)

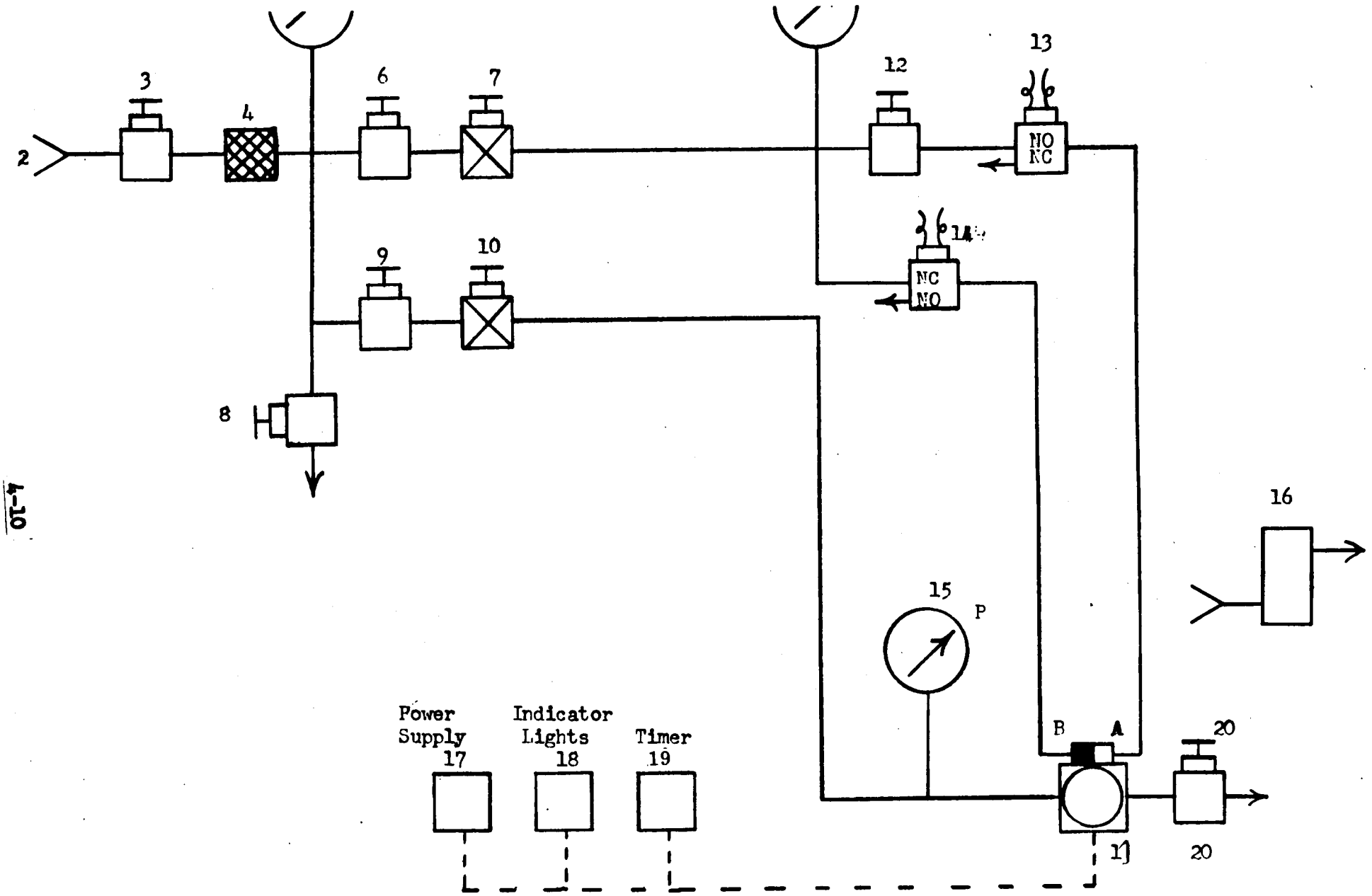
Note: Manufacturer, Model/Part Number, and Serial Number columns shall be completed during the test.

Table 4-2. Functional Test Data

Test	Conditions			Results	
	Valve Pressure (psig)	Valve Medium	Actuator Pressure (psig)	Specimen 1	Specimen 2
Internal Leakage	300	GN_2	750	0 sccm	0 sccm
	300	LN_2	750	416 sccm	333 sccm
Opening Time	300	GN_2	750	0.90 sec	0.84 sec
	300	GN_2	800	0.92 sec	0.70 sec
	300	LN_2	750	0.78 sec	0.87 sec
	300	LN_2	800	0.82 sec	0.89 sec
Closing Time	300	GN_2	750	1.05 sec	1.00 sec
	300	GN_2	800	1.01 sec	1.00 sec
	300	LN_2	750	1.07 sec	1.00 sec
	300	LN_2	800	1.01 sec	0.97 sec
Valve Opening (Loss of actuator pressure)	300	LN_2	0-psig	0.96 sec	1.59 sec
Insulation Resistance:					
Switch A:					
NO pin to NC pin				40,000 mego	100,000 mego
NO pin to com.				80,000 mego	210,000 mego
NC pin to com.				81,000 mego	200,000 mego
NO pin to case				40,000 mego	90,000 mego
NC pin to case				50,000 mego	90,000 mego

Table 4-2. Functional Test Date (Continued)

Switch B:					
NO pin to NC pin				100,000 mego	100,000 mego
NO pin to com.				150,000 mego	120,000 mego
NC pin to com.				150,000 mego	130,000 mego
NO pin to case				100,000 mego	100,000 mego
NC pin to case				100,000 mego	100,000 mego



Note: All lines ¼-inch.
Refer to table 4-1 for item identification.
Dash lines represent electrical circuitry.

Figure 4-1. Functional Test Schematic (GN_2)

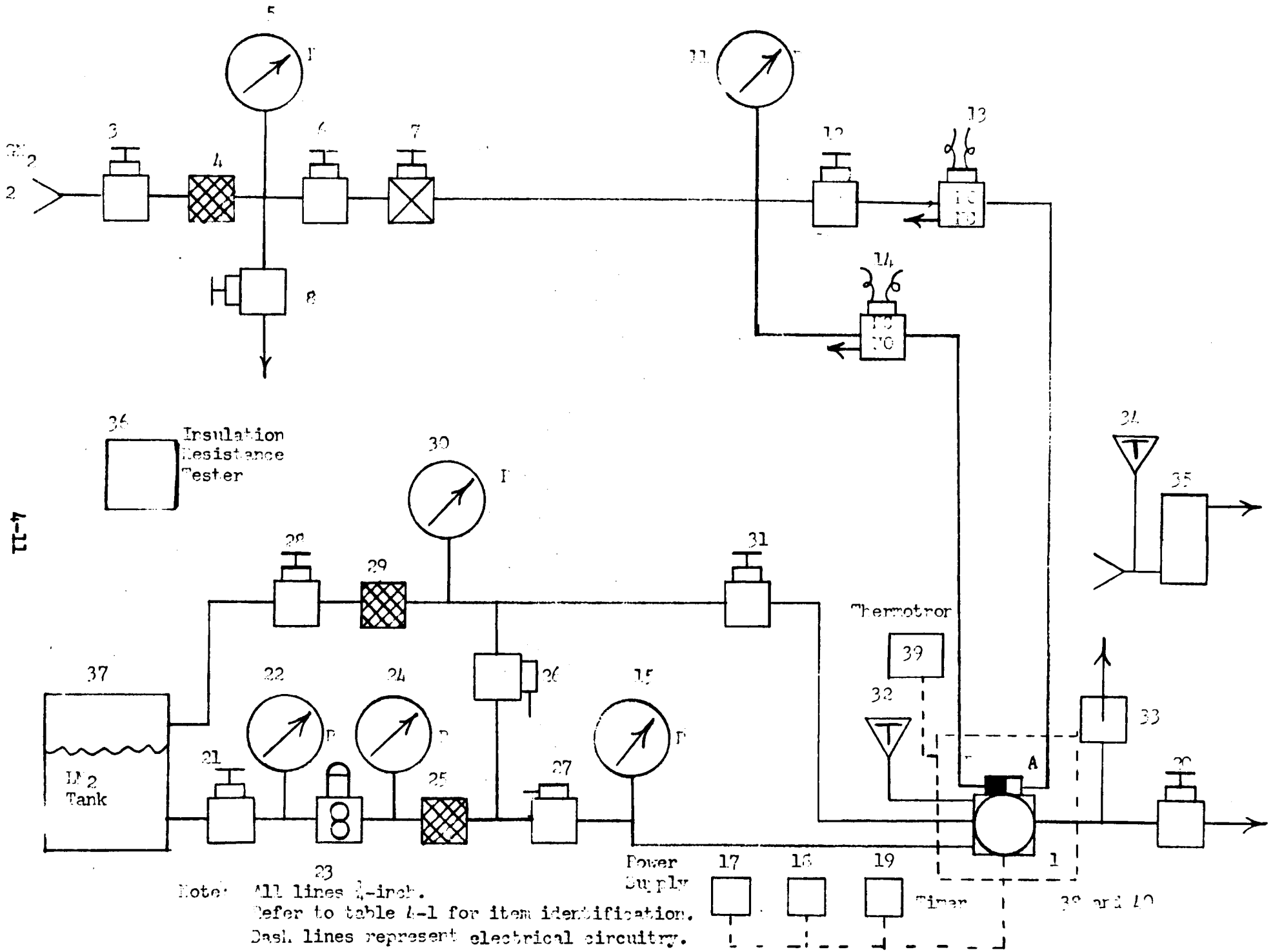


Figure 4-2. Functional Test Schematic (LN2)

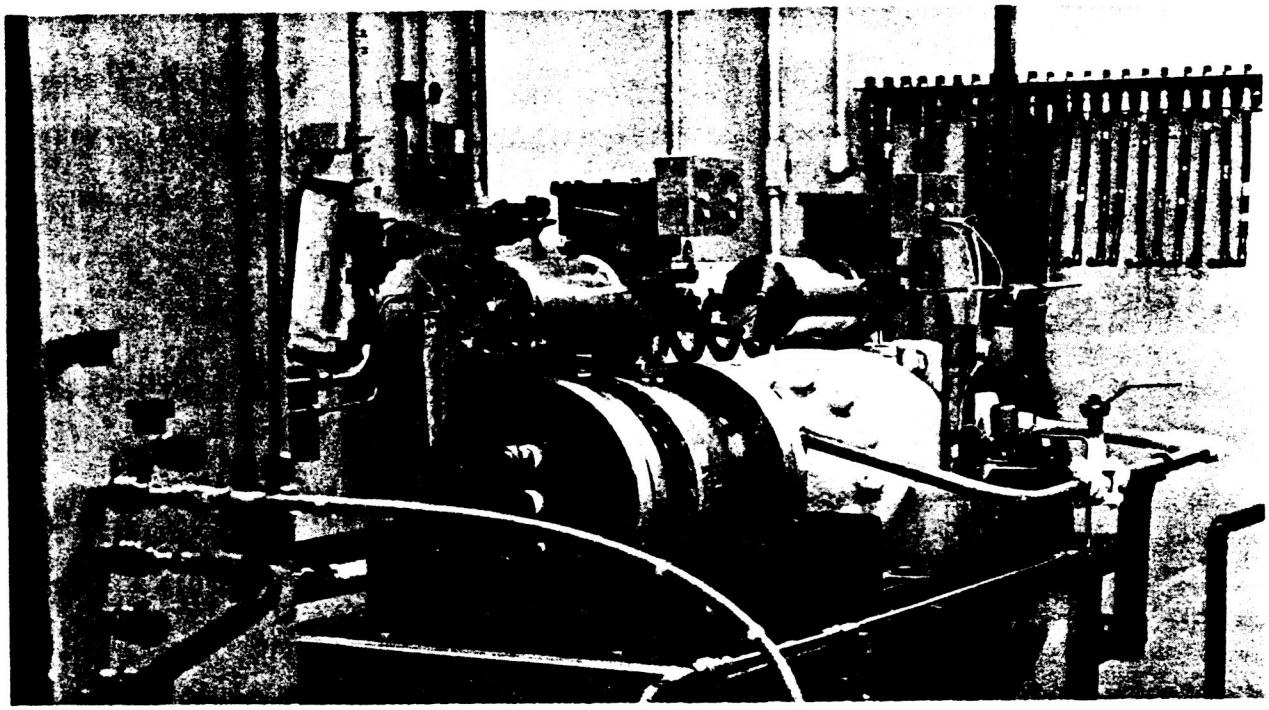


Figure 4-3. Functional Test Setup

SECTION V

TEMPERATURE SHOCK TEST

5.1 TEST REQUIREMENTS

5.1.1 The temperature of the test specimens shall be stabilized at 125 (+4, -0)°F.

5.1.2 The relative humidity shall be maintained at 20 (± 5) per cent.

5.1.3 LN_2 shall be flowed through the specimen and a functional test shall be performed as described in section IV when the temperature stabilizes at 125°F.

5.1.4 A functional test shall be performed after the high temperature exposure as specified in section IV.

5.2 TEST PROCEDURE

5.2.1 The specimen was installed in a high temperature chamber as shown in figure 4-2 using the equipment listed in table 4-1. Thermocouples were installed on the surface of the specimen.

5.2.2 The temperature of the chamber was increased to 125°F using thermotron 2.

5.2.3 The temperature of the specimen was allowed to stabilize at 125°F and temperature was maintained for 72 hours.

5.2.4 During the 72-hour period, valves 21, 27, 31, and 28 were opened and pump 23 was started.

5.2.5 LN_2 at -320°F was flowed in and out of the test specimen inlet. While LN_2 was flowing, specimen 1 (S/N 203) was open and specimen 2 (S/N 204) was closed.

5.2.6 After LN_2 flow was established, the setup shown in figure 4-2 was disconnected and the specimen was installed as shown in figure 4-1.

5.2.7 Specimen 2 was subjected to a functional test immediately. As specimen 1 (in the open position) was filled with LN_2, LN_2 boil-off in the specimen outlet prevented an immediate check of seat leakage.

5.2.8 The specimen temperature was allowed to stabilize at room temperature and a functional test was performed in accordance with section IV.

5.3 TEST RESULTS

Seat leakage measured for both specimens at low temperature was above the minimum requirement of 300 sccm. Seat leakage measured

at ambient temperature was satisfactory. All other functional test results were satisfactory.

5.4 TEST DATA

The data presented in tables 5-1 and 5-2 were recorded following temperature shock at low temperature and at room temperature.

Table 5-1. Post-Temperature Shock Functional Test Data (Low Temperature)

Test	Results	
	Specimen 1	Specimen 2
Leakage	133 sccm	833 sccm
Opening Time	0.79 sec	0.89 sec
Closing Time	1.03 sec	1.03 sec

Table 5-2. Post-Temperature Shock Functional Test Data (Room Temperature)

Test	Results	
	Specimen 1	Specimen 2
Leakage	0 sccm	0 sccm
Opening Time	0.80 sec	0.76 sec
Closing Time	1.02 sec	0.95 sec

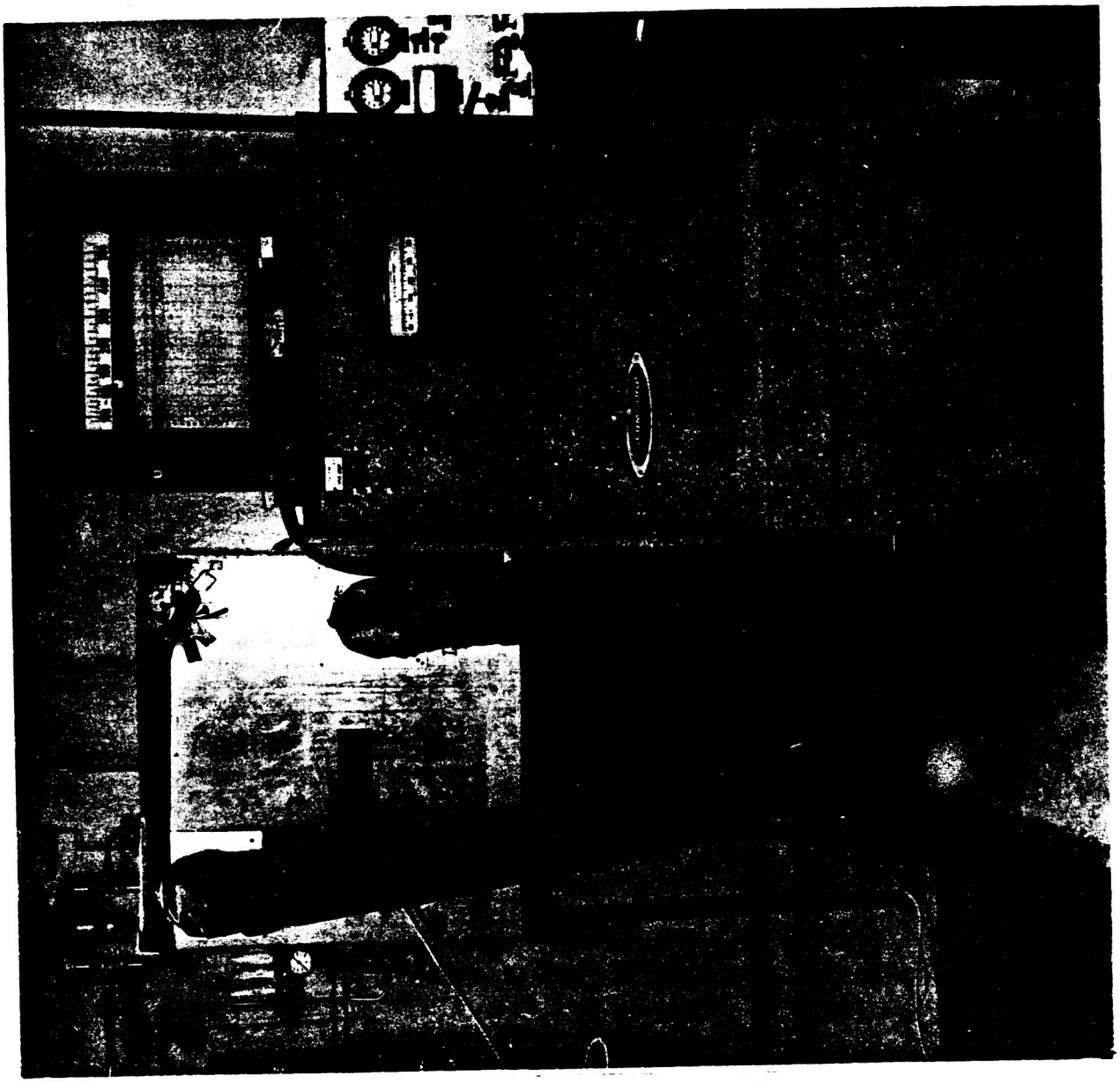


Figure 5-1. Temperature Shock Test Setup

SECTION VI

SURGE TEST

6.1 TEST REQUIREMENTS

6.1.1 The valve shall be closed and the valve body shall be pressurized on the upstream side from zero (+5, -0) psig to 300 (+5, -0) psig within 100 milliseconds. This operation constitutes one cycle. A total of 1000 cycles shall be performed using N_2 at -320°F as the pressure medium.

6.1.2 A functional test as specified in section IV shall be performed upon completion of this test.

6.2 TEST PROCEDURE

6.2.1 The specimen was installed as shown in figures 6-1 and 6-2 using the equipment listed in table 6-1.

6.2.2 Hand valves 3 and 6 were opened and the 3200-psig supply pressure was monitored on gage 5.

6.2.3 Hand valve 12 was opened and actuator port A was pressurized to 750 psig by adjusting regulator 7. Actuator pressure was monitored on gage 11.

6.2.4 The test specimen was closed by simultaneously actuating solenoid valves 13 and 14.

6.2.5 Valves 19, 23, and 25 were opened, pump 21 was started, and LN_2 was pumped in and out of the specimen inlet. Specimen pressure was monitored by transducer 16 and maintained below 50 psig.

6.2.6 Hand valve 9 was opened and the inlet of solenoid valve 15 was pressurized to 300 psig by adjusting regulator 10.

6.2.7 Solenoid valves 15 and 25 were actuated simultaneously. The pressure rise rate was monitored with transducer 16 and recorded with oscillograph 17. The pressure increased from 50 to 300 psig within 100 milliseconds. Solenoid valves 15 and 25 were simultaneously deactuated and the specimen pressure was allowed to vent to 50 psig.

6.2.8 The specimen was subjected to 1000 pressure impulses from 50 to 300 psig by simultaneously actuating and then deactuating solenoid valves 15 and 25.

6.2.9 The specimen was subjected to a functional test as described in section IV following the surge test.

6.3 TEST RESULTS

6.3.1 A 50-to 300-psig pressure surge was accomplished in 100 milliseconds. The specimen was subjected to 1000 pressure surges.

6.3.2 Functional test data recorded following the surge test were satisfactory.

6.4 TEST DATA

6.4.1 A typical surge waveform as recorded during the test is presented in figure 6-3.

6.4.2 Functional test data recorded after the surge test are presented in table 6-2.

Table 6-1. Surge Test Equipment List

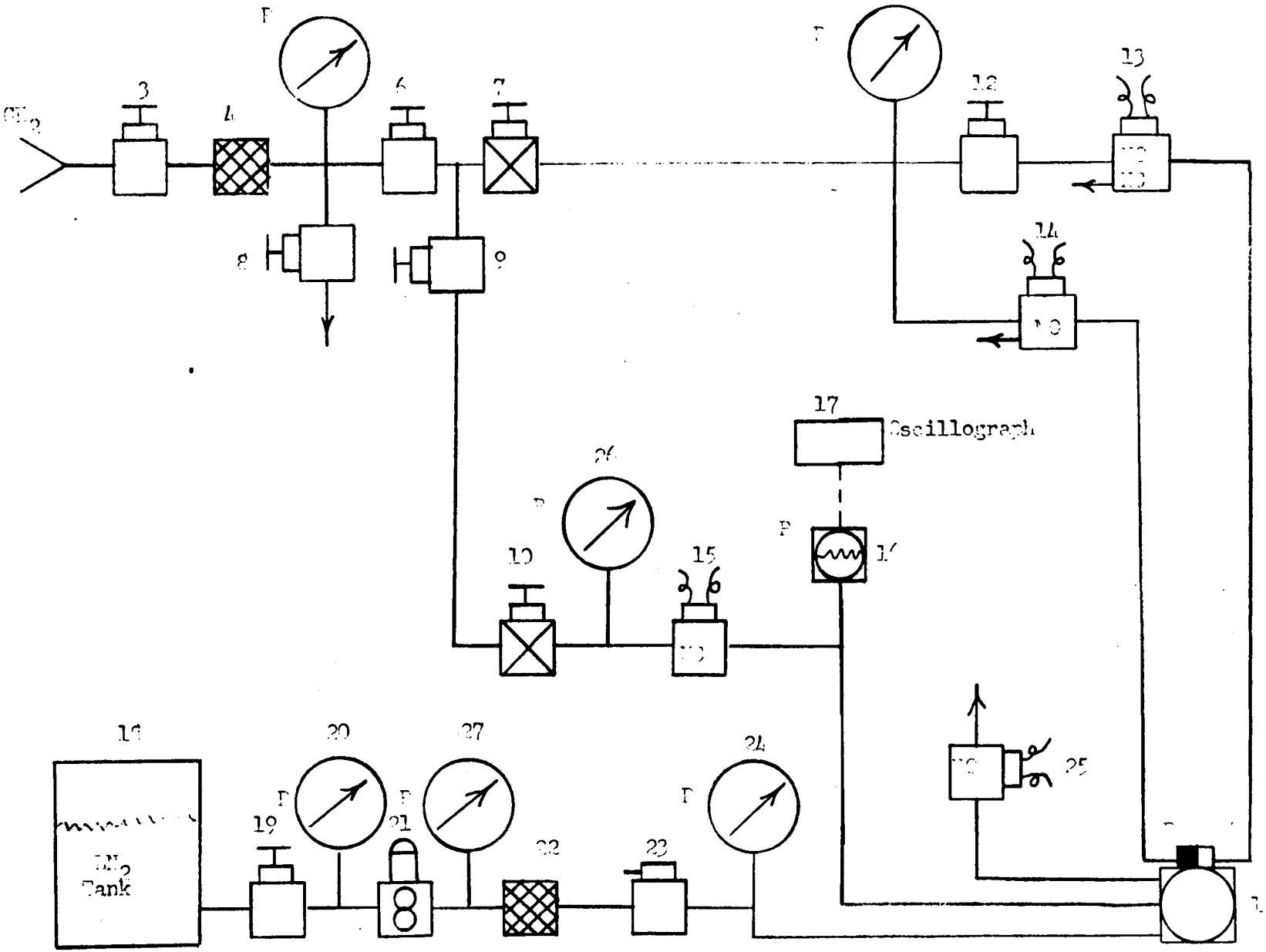
Item No.	Item	Manufacturer	Model/ Part No.	Serial No.	Remarks
1	Test Specimen	Parker Aircraft Company	F914	203 and 204	Pneumatically operated shut-off valve
2	GN_2 Pressure Source	N/A	N/A	N/A	3000-psig
3	Hand Valve	Combination Pump Valve Company	130P5	N/A	1-inch
4	Filter	Bendix Corp. Filter Div.	2-S-13460 16-P-0	N/A	2-micron
5	Pressure Gage	Acco Helicoid	N/A	08-113-200577-AA	0-to 5000-psig ±1.0% FS accuracy Cal. date 8-16-66
6	Hand Valve	Robbins Aviation	N/A	TT-180	½-inch
7	Pressure Regulator	Grove Valve and Regulator Company	18	N/A	0-to 600-psig inlet 0-to 6000-psig outlet
8	Hand Valve	Robbins Aviation	TT-180	N/A	½-inch
9	Hand Valve	Robbins Aviation	TT-180	N/A	½-inch
10	Pressure Regulator	Grove Valve and Regulator Company	18	N/A	0-to 6000-psig inlet 0-to 6000-psig outlet
11	Pressure Gage	Seegers Instrument Company	2122-25	08-113-200577 G	0-to 4000-psig ±0.1% FS accuracy Cal. date 9-16-66
12	Hand Valve	Robbins Aviation	SSKA-250-4T	N/A	¼-inch
13	Solenoid Valve	Marotta Valve Co.	MV-74	N/A	¼-inch, 3-way NO

Table 6-1. Surge Test Equipment List (Continued)

Item No.	Item	Manufacturer	Model/ Part No.	Serial No.	Remarks
14	Solenoid Valve	Marotta Valve Co.	MV-74	N/A	$\frac{1}{4}$-inch 3-way, NC
15	Solenoid Valve	Southwestern Valve Co.	MV-121	N/A	1-inch, NC
16	Pressure Transducer	CEC	4-350-0001	N/A	0-to 500-psia
17	Oscillograph	CEC	124	08-113-012586	Cal. date 11-1-66
18	LN_2 Tank	Cosmodyne	N/A	N/A	250-gal.
19	Hand Valve	Hills-McCanna	N/A	N/A	1-inch ball valve
20	Pressure Gage	Ashcroft	N/A	08-113-200507-I	0-to 400-psig Cal. date 9-16-66
21	LN_2 Pump	Cosmodyne	N/A	1	0-to 1500-psig
22	Filter	Puroflo	3258	N/A	10-micron
23	Pneumatically operated valve	Research Controls	21388	N/A	1-inch
24	Pressure Gage	Seegers Instrument Company	2122-11	08-113-200577-F	0-to 1000-psig ±0.1% FS accuracy Cal. date 9-16-66
25	Solenoid Valve	Asco Co.	WP-826812 LT	N/A	$\frac{1}{2}$-inch, NO
26	Pressure Gage	Acco Helicoid	N/A	08-113-200577J	0-to 5000-psig ±1.0% FS accuracy Cal. date 8-16-66
27	Pressure Gage	Ashcroft	N/A	08-113 200507-P	0-to 3000-psig ±1.0% FS accuracy Cal. date 9-16-66

Table 6-2. Functional Test Data Obtained After 1000 Pressure Surges

Test	Results	
	Specimen 1	Specimen 2
Leakage	0 sccm	0 sccm
Opening Time	0.81 sec	0.77 sec
Closing Time	1.04 sec	0.96 sec



Note: All lines ¼-inch.
Refer to table 6-1 for item identification.

Figure 6-1. Surge Test Schematic

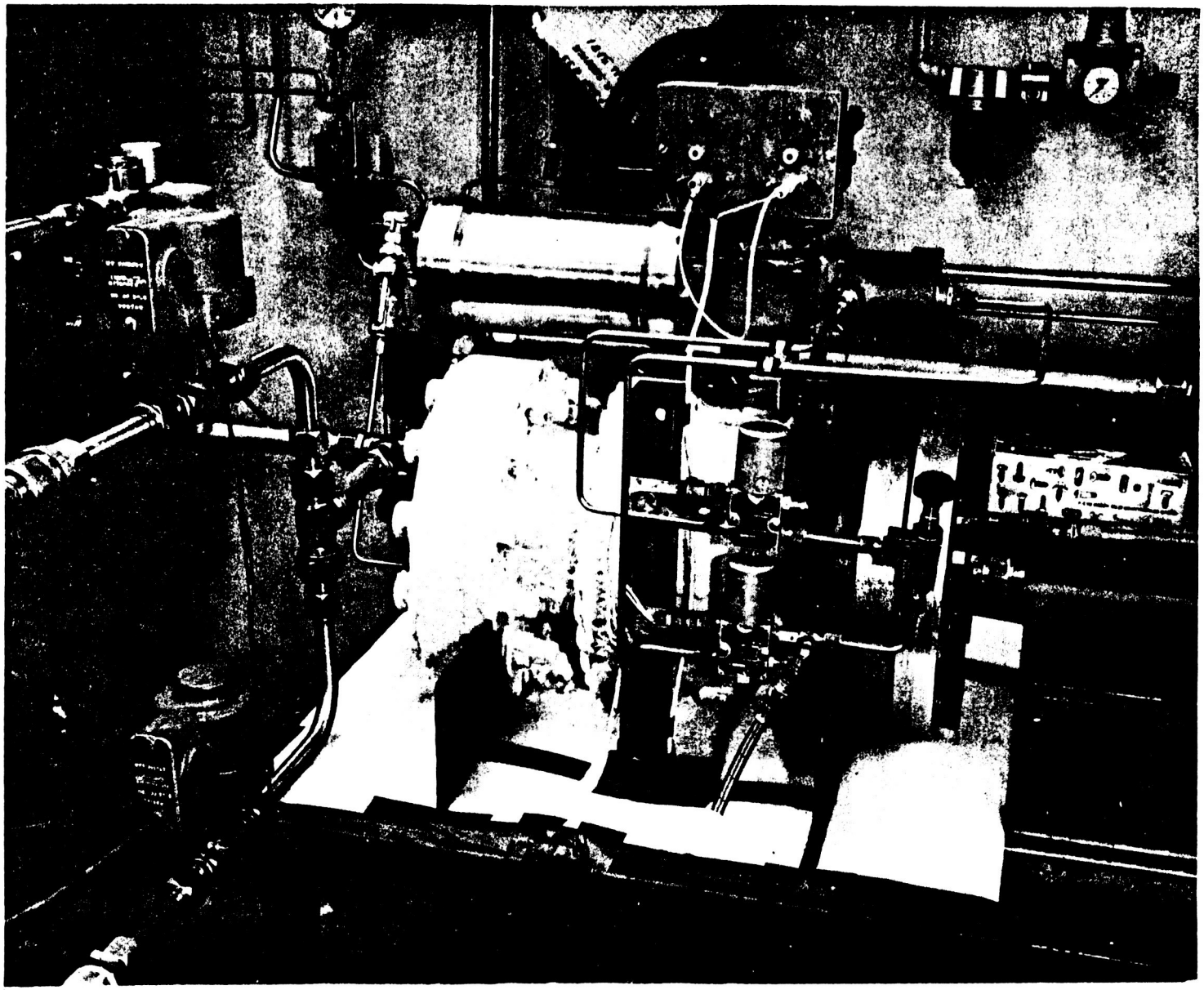


Figure 6-2. Surge Test Setup

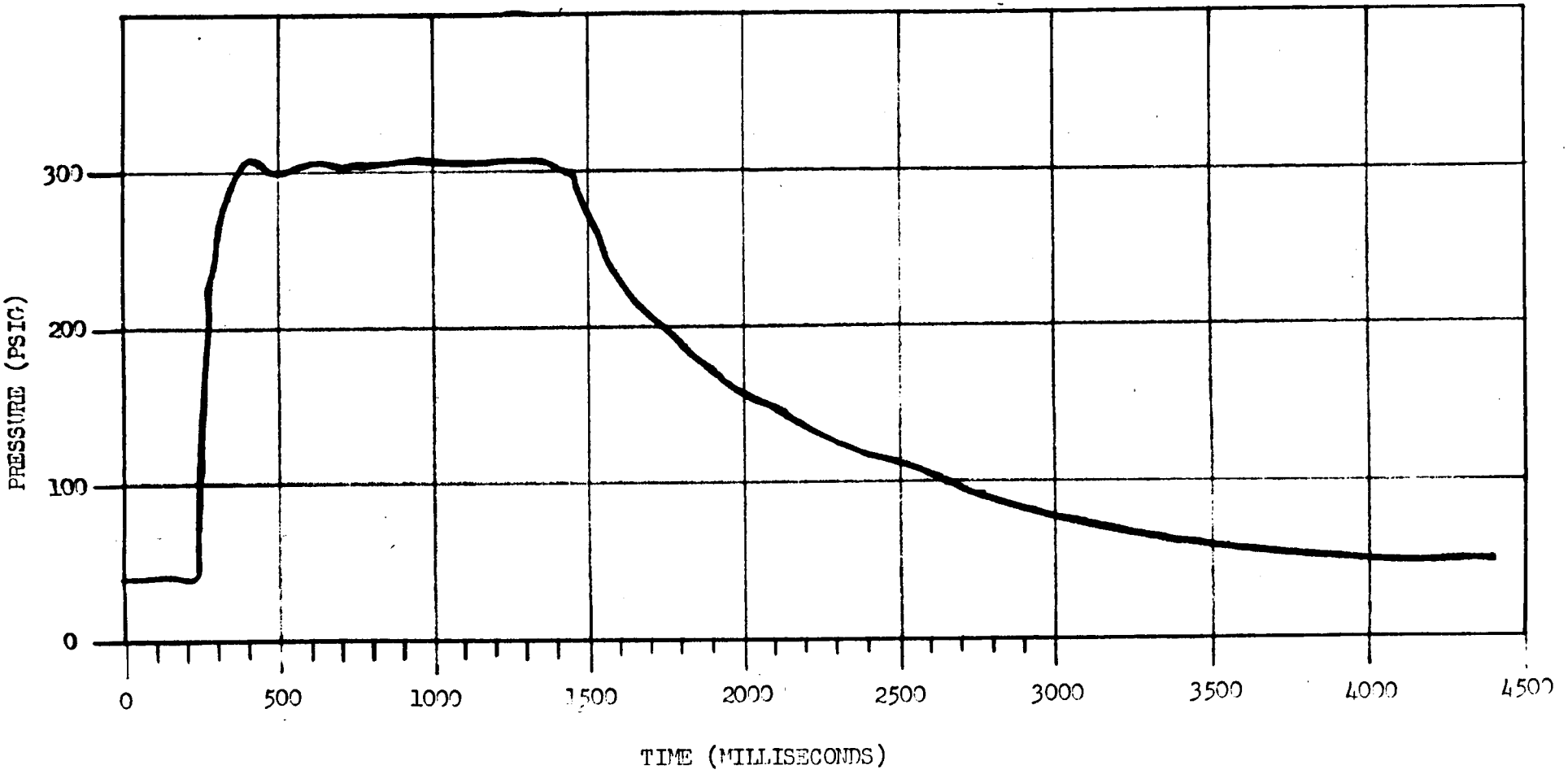


Figure 6-3. Typical Surge Test Waveform

SECTION VII

ICING TEST

7.1 TEST REQUIREMENTS

7.1.1 An icing test shall be performed to determine the ability of the test specimen to perform under iced conditions.

7.1.2 The icing test shall be performed in accordance with section 14 of KSC-STD-164(D).

7.1.3 The temperature in the test chamber shall be regulated and maintained at 5°F.

7.1.4 Spray nozzles shall emit water in droplets with a minimum diameter of 1.5 millimeters.

7.1.5 Water precooled to 40°F shall flow through each spray nozzle at a rate of approximately 2 gallons per minute.

7.1.6 Spray nozzles shall be located at a minimum distance of 2 feet from the test specimen.

7.1.7 Functional tests shall be performed during and after the icing test.

7.2 TEST PROCEDURE

7.2.1 The specimen was installed as shown in figures 4-2 and 7-1 using the equipment listed in table 4-1.

7.2.2 The temperature was stabilized in the test chamber at 5°F.

7.2.3 Water at 40°F was injected into the test chamber. Injection of the water was continued until a minimum of $\frac{1}{2}$ inch of ice had formed on the test specimen.

7.2.4 A functional test was performed as specified in section IV.

7.2.5 The temperature in the test chamber was returned to ambient room conditions.

7.2.6 Within 1 hour after completing the icing test, the specimen was visually inspected for formation of ice on moving parts and a functional test was performed as specified in section IV.

7.3 TEST RESULTS

7.3.1 A coat of ice with a minimum thickness of $\frac{1}{2}$ inch was deposited on each specimen. Specimen 2 is shown in figure 7-1.

7.3.2 Seat leakage measured during the icing test was greater than the specified minimum of 6 sccm. All other functional test data recorded during and after the icing test were satisfactory.

7.4 TEST DATA

The functional test data obtained during and after the icing test are presented in tables 7-1 and 7-2.

Table 7-1. Functional Test Data Obtained During Icing Test

Test	Results	
	Specimen 1	Specimen 2
Leakage	50 sccm	83.3 sccm
Opening Time	0.87 sec	0.79 sec
Closing Time	1.85 sec	1.0 sec
Insulation		
Resistance:		
Switch A:		
NO pin to NC pin	2000 mego	2000 mego
NO pin to com.	2000 mego	100,000 mego
NC pin to com.	2000 mego	100,000 mego
NO pin to case	5000 mego	50,000 mego
NC pin to case	5000 mego	100,000 mego
Switch B:		
NO pin to NC pin	2000 mego	2000 mego
NO pin to com.	2500 mego	100,000 mego
NC pin to com.	2500 mego	100,000 mego
NO pin to case	5000 mego	100,000 mego
NC pin to case	5000 mego	50,000 mego

Table 7-2. Functional Test Data Obtained After Icing Test

Test	Results	
	Specimen 1	Specimen 2
Leakage	0 sccm	0 sccm
Opening Time	0.81 sec	0.78 sec
Closing Time	1.06 sec	0.99 sec

Figure 7-1. Specimen 2 During Icing Test

SECTION VIII

CYCLE TEST

8.1 TEST REQUIREMENTS

8.1.1 The test specimen shall be subjected to 1000 open-close cycles.

8.1.2 The test medium used for the cycle test shall be N_2 at -320°F.

8.1.3 A functional test in accordance with section IV shall be performed after 100, 500, and 1000 cycles.

8.2 TEST PROCEDURE

8.2.1 The specimen was installed as shown in figure 4-2, using the equipment listed in table 4-1. The position-indicating switches were connected as shown in figure 8-1 using the equipment listed in table 8-1. The test setup is shown in figures 8-2 and 8-3.

8.2.2 Valves 21, 27, 31, and 28 were opened. Pump 23 was started and LN_2 was flowed in and out of the test specimen inlet.

8.2.3 The specimen was pressurized to 300 psig by adjusting hand valve 31. The specimen pressure was monitored with pressure gage 15.

8.2.4 The position-indicating switches were loaded to 10 amperes by adjusting load bank 3.

8.2.5 The specimen was subjected to 1000 open-close cycles.

8.2.6 A functional test as specified in section IV was performed after 100, 500, and 1000 cycles.

8.2.7 Following 100 and 500 cycles, functional tests were performed immediately after boiloff stopped and before the specimen returned to ambient temperature. Following 1000 cycles, the functional tests were performed after the valve had reached ambient temperature.

8.3 TEST RESULTS

8.3.1 The specimens were subjected to 1000 open-close cycles.

8.3.2 Position-indicator switch operation was satisfactory during the 1000 cycles.

8.3.3 Following 100 and 500 cycles, valve seat leakage was above the specified minimum of 6 sccm. All other functional test results were satisfactory.

8.4 TEST DATA

8.4.1 Test data presented in tables 8-2, 8-3, and 8-4 were recorded after 100, 500, and 1000 open-close cycles, respectively.

Table 8-1. Position-Indicator Switch Test Equipment List

Item No.	Item	Manufacturer	Model/ Part No.	Serial No.	Remarks
1	Test Specimen	Parker Aircraft Company	F914-2	203 and 204	Pneumatically operated shut-off valve
2	Power Supply	Perkin	N/A	N/A	300-amp,28-vdc
3	Load Bank	Sun Co.	GL-B-3A	N/A	
4	Shunt	Weston	N/A	08-113-106-1042B	Cal. date 8-18-66
5	Voltmeter	Hewlitt-Packard	412A	08-113 017912	VTVM Cal. date 9-22-66
6	Insulation Resistance Tester	General Radio Co.	1862C	08-113-018416	Cal. date 8/9/66

Table 8-2. Functional Test Data Obtained After 100 Cycles

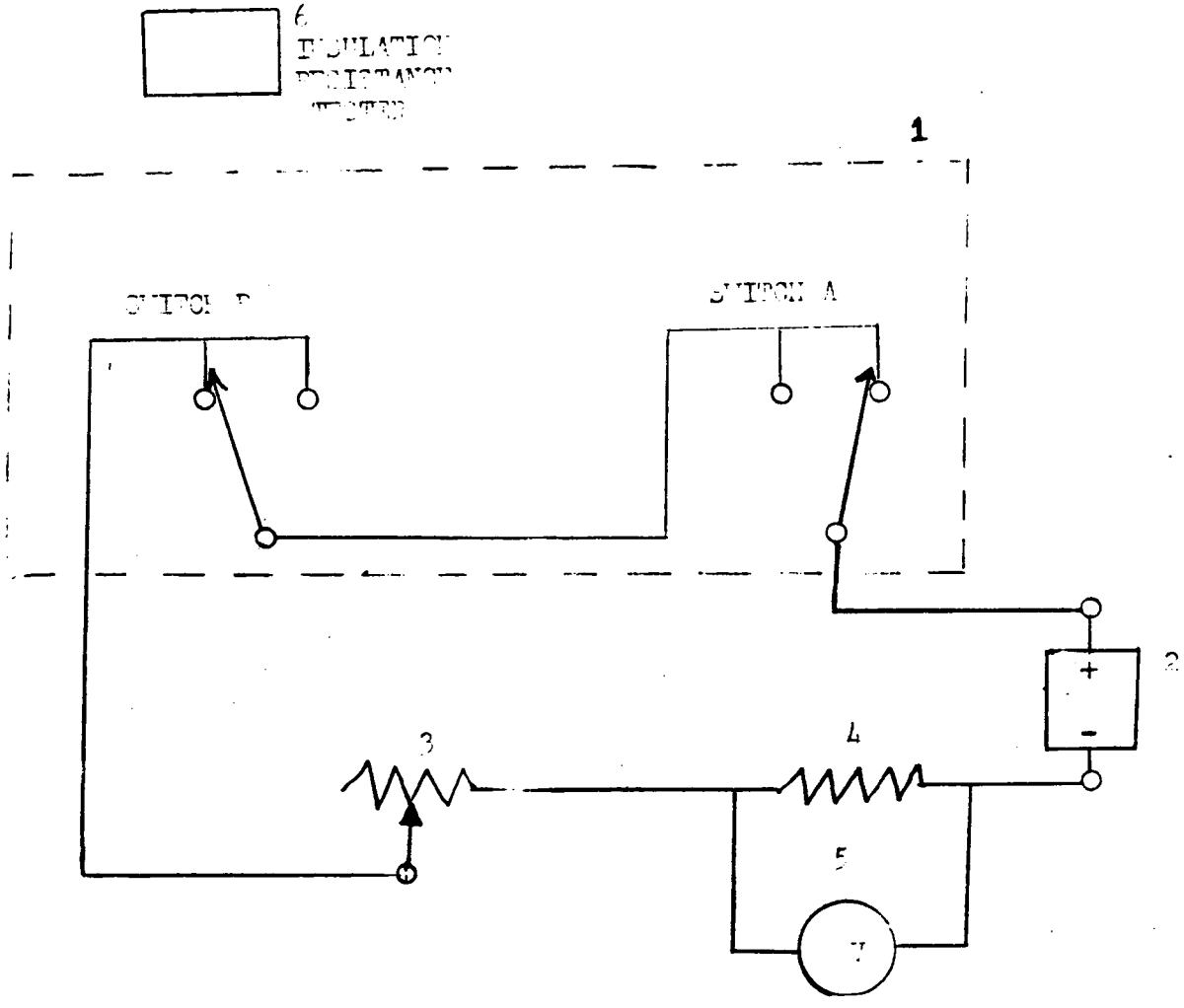
Test	Results	
	Specimen 1	Specimen 2
Leakage	4166 sccm	1250 sccm
Opening Time	0.80 sec	0.76 sec
Closing Time	1.09 sec	0.97 sec

Table 8-3. Functional Test Data Obtained After 500 Cycles

Test	Results	
	Specimen 1	Specimen 2
Leakage	4166 sccm	1250 sccm
Opening Time	0.79 sec	0.79 sec
Closing Time	1.07 sec	1.02 sec

Table 8-4. Functional Test Data Obtained After 1000 Cycles

Test	Results	
	Specimen 1	Specimen 2
Leakage	0 sccm	0 sccm
Opening Time	0.80 sec	0.78 sec
Closing Time	1.08 sec	1.00 sec
Insulation Resistance:		
Switch A:		
NO pin to com.	350,000 mego	120,000 mego
NC pin to com.	250,000 mego	110,000 mego
NO pin to case	200,000 mego	110,000 mego
NC pin to case	75,000 mego	50,000 mego
Switch B:		
NO pin to com.	250,000 mego	150,000 mego
NC pin to com.	250,000 mego	150,000 mego
NO pin to case	150,000 mego	150,000 mego
NC pin to case	75,000 mego	50,000 mego



Note: Refer to table 8-1 for item identification.

Figure 8-1. Position-Indicating Switch Schematic

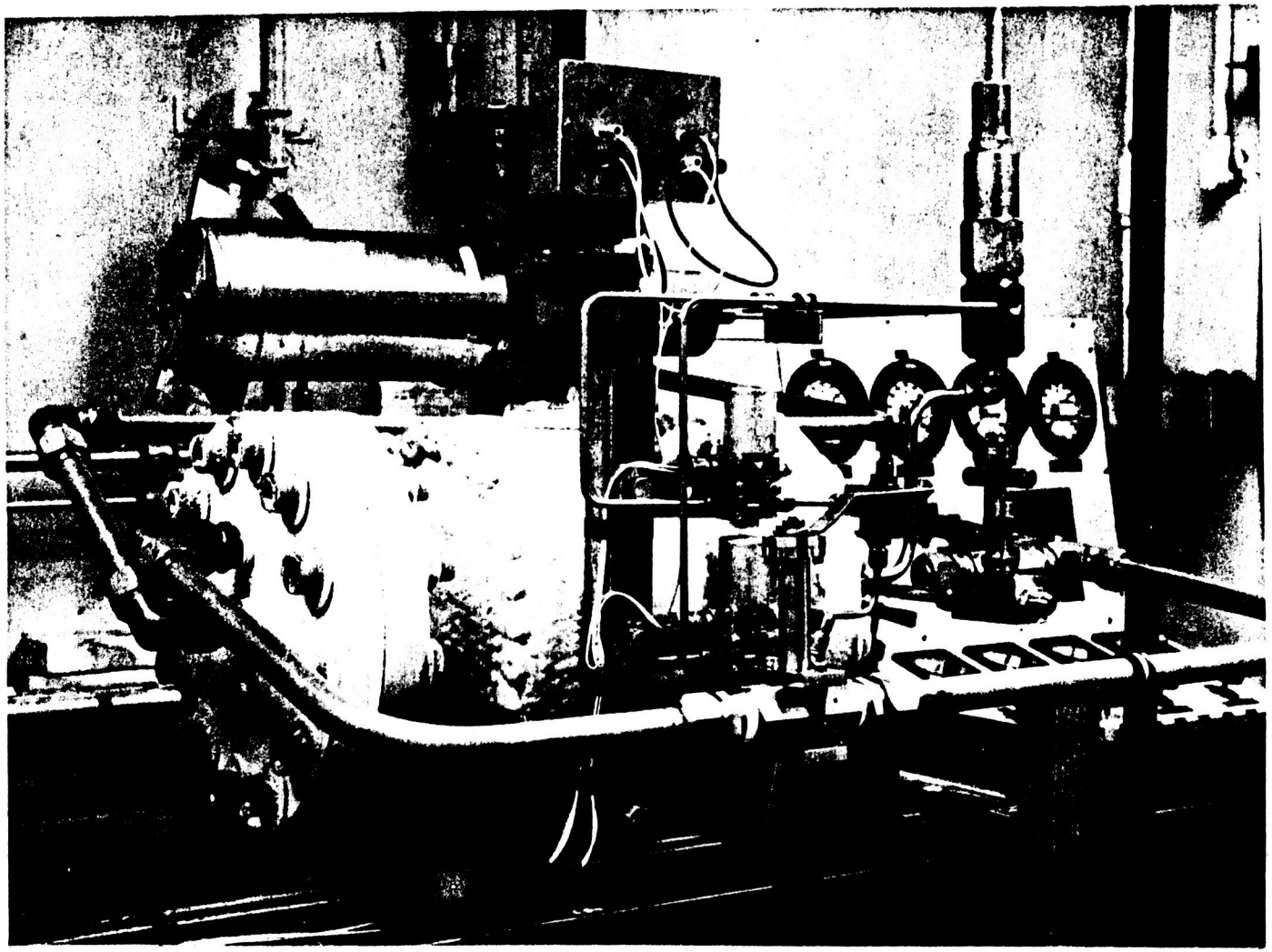


Figure 8-2. Cycle Test Setup

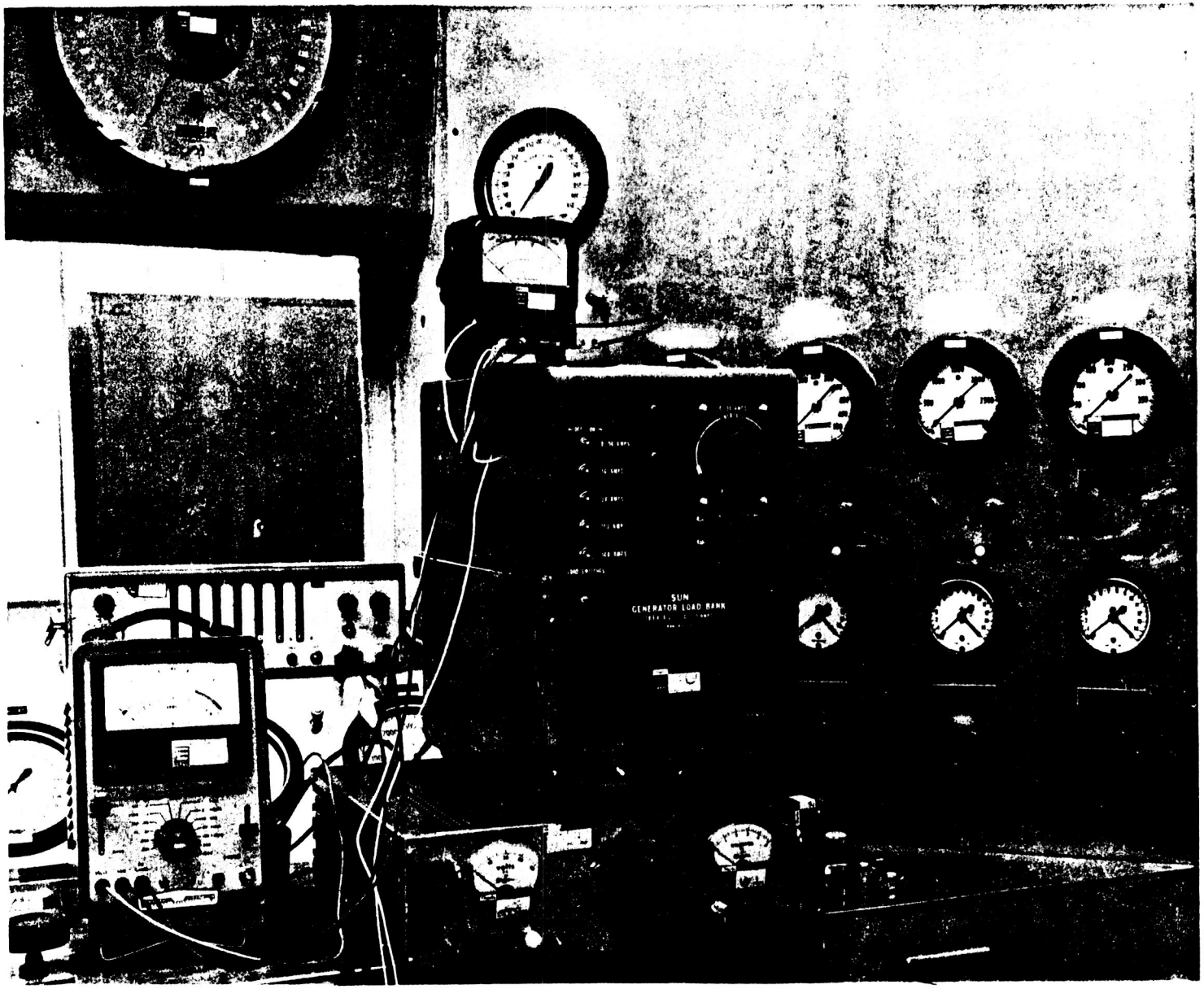


Figure 8-3. Switch Loading Equipment Setup

SECTION IX

BURST TEST

9.1 TEST REQUIREMENTS

9.1.1 The valve portion of the test specimen shall be hydrostatically pressurized to 1200 psig for 5 minutes.

9.1.2 The actuator of the test specimen shall be hydrostatically pressurized to 3000 psig for 5 minutes.

9.1.3 The test specimen shall be visually inspected for structural damage or leakage.

9.1.4 The valve portion of one specimen only shall be slowly pressurized hydrostatically until failure occurs. The actuator of one specimen only shall be slowly pressurized hydrostatically until failure occurs.

9.2 TEST PROCEDURE

9.2.1 The specimen was installed as shown in figure 9-1 using equipment listed in table 9-1.

9.2.2 It was determined that all connections were tight, all gages were installed and operating properly, and all valves were closed.

9.2.3 Valves 3, 5, 6, 8, 10, 11, and 12 were opened and pump 2 was actuated to fill the system with water and to purge all air from the system. Valves 10, 11, 12, 5, 6, and 8 were closed. The valve specimen was pressurized to 1200 psig with pump 2. Valve 3 was closed. This pressure was held for 5 minutes. The pressure was vented through valve 10. The specimen was inspected for damage.

9.2.4 Valves 5 and 6 were opened. One side of the actuator specimen was pressurized to 3000 psig and valve 6 was closed. This pressure was held for 5 minutes. The pressure was released through valve 10 and the specimen was inspected for damage.

9.2.5 Valve 8 was opened. The other side of the actuator was pressurized to 3000 psig and valve 8 was closed. This pressure was held for 5 minutes. The pressure was released through valve 12 and the specimen was inspected for damage.

9.2.6 On one specimen only, valves 11, 12, and 13 were closed, and valves 5, 6, and 8 were opened. The actuator was pressurized until the actuator pressure reached 4000 psig.

9.2.7 On both specimens, hand valves 5 and 10 were closed, and hand valve 3 was opened. An attempt was made to pressurize the valve body of each specimen until the valve body burst or the pressure reached 1600 psig.

9.3 TEST RESULTS

9.3.1 No external damage or distortion resulted from pressurizing each port of the actuator on specimens 1 and 2 to 3000 psig for 5 minutes.

9.3.2 No external damage or distortion resulted from pressurizing each valve specimen to 1200 psig for 5 minutes.

9.3.3 The actuator on specimen 2 was pressurized to 4000 psig without rupture.

9.3.4 An attempt was made to pressurize the valve body on specimen 1 to 1600 psig. However, leakage from the split body seal occurred at a rate which prevented pressurization above 1450 psig.

9.3.5 As specimen 1 could not be pressurized to burst or 1600 psig, an attempt was made to pressurize specimen 2 to this pressure. Leakage from the split body seal also occurred in specimen 2 and prevented pressurization of the specimen above 1550 psig.

9.3.6 Figures 9-2 and 9-3 show specimen 1 and 2, respectively, following the burst test.

9.4 TEST DATA

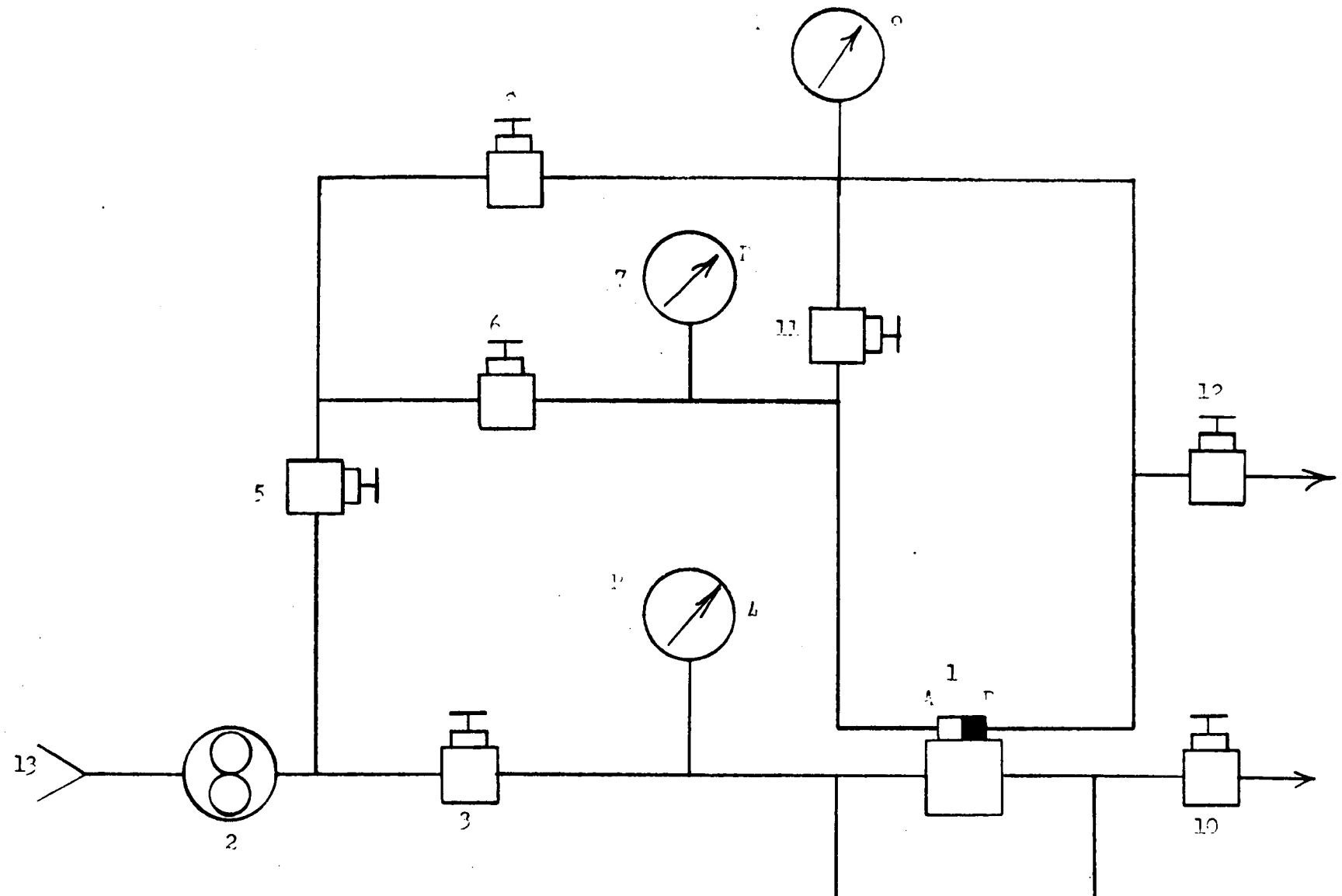
The data presented in table 9-2 were recorded during the burst test.

Table 9-1. Burst Test Equipment List

Item No.	Item	Manufacturer	Model/ Part No.	Serial No.	Remarks
1	Test Specimen	Parker Aircraft Company	F914-2	203 and 204	Pneumatically operated shut-off valve
2	Water Pump	Sprague Engineer-	300-16 -64	N/A	0-to 30,000-psig
3	Hand Valve	Aminco	N/A	N/A	¼-inch
4	Pressure Gage	Ashcroft	N/A	08-113-95-1395 B	0-to 10,000-psig **Cal. date 11-4-66**
5	Hand Valve	Aminco	N/A	N/A	¼-inch
6	Hand Valve	Robbins Aviation	SSKA 250-4T	N/A	¼-inch
7	Pressure Gage	Ashcroft	N/A	08-113 95-1395 B	0-to 10,000-psig **Cal. date 11-4-66**
8	Hand Valve	Robbins Aviation	SSKA 250 4T	N/A	¼-inch
9	Pressure Gage	Ashcroft	N/A	08-113 95-1395 B	0-to 10,000-psig **Cal. date 11-4-66**
10	Hand Valve	Robbins Aviation	SSKA 250-4T	N/A	¼-inch
11	Hand Valve	Robbins Aviation	SSKA 250-4T	N/A	¼-inch
12	Hand Valve	Robbins Aviation	SSKA 250-4T	N/A	¼-inch
13	H_2O Source	N/A	N/A	N/A	

Table 9-2. Burst Test Data

Component	Pressure	Results	
		Specimen 1	Specimen 2
Actuator Port A	3000 psig for 5 min.	No Distortion	No Distortion
Actuator Port B	3000 psig for 5 min.	No Distortion	No Distortion
Actuator Ports A and B Simultaneously	4000 psig	No Rupture	No Rupture
Valve	1200 psig	No Distortion	No Distortion
	1450 psig	No Rupture	
	1550 psig		No Rupture



Note: All lines ¼-inch.
Refer to table 9-1 for item identification.

Figure 9-1. Burst Pressure Test Schematic

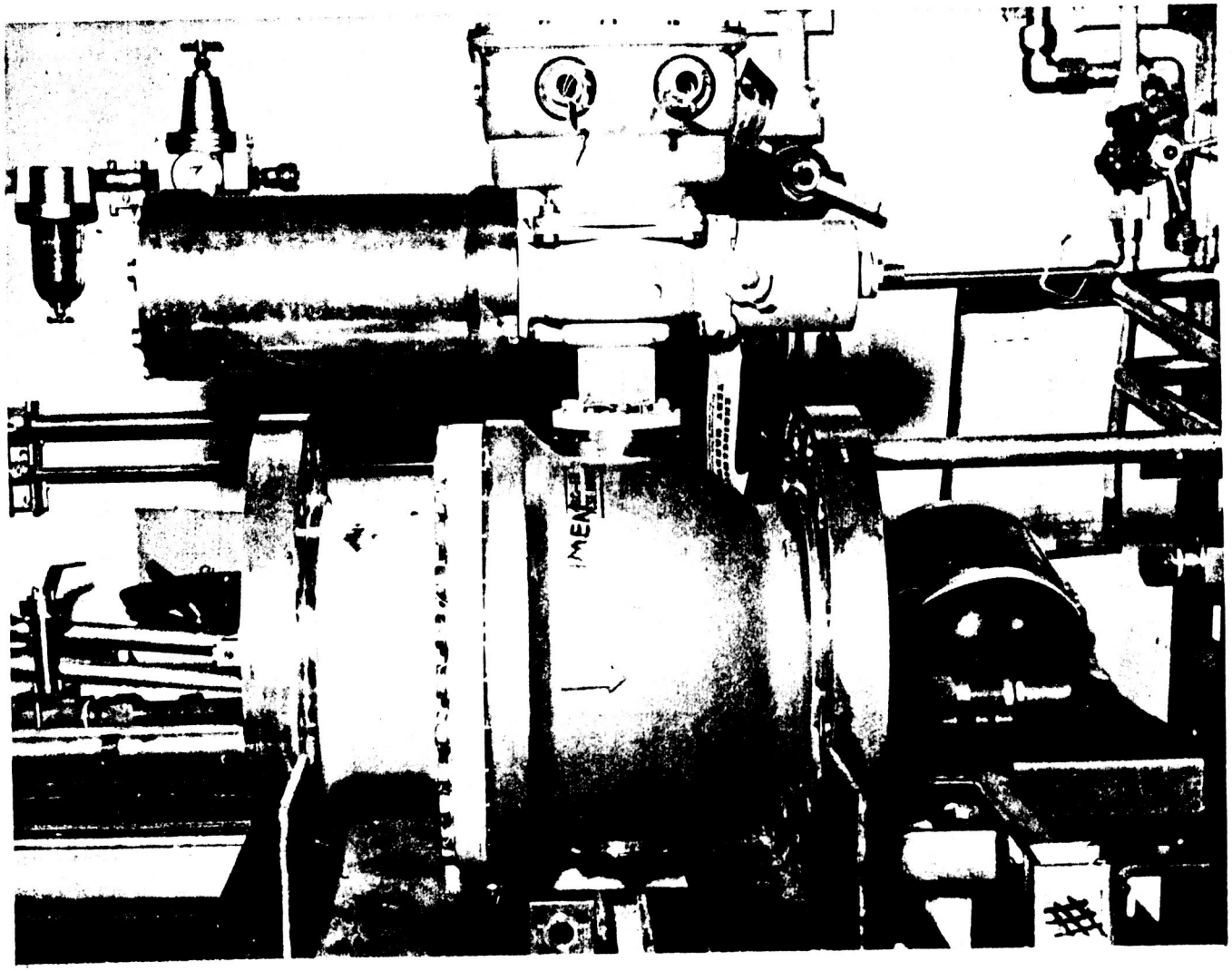


Figure 9-2. Specimen 1 After Burst Test

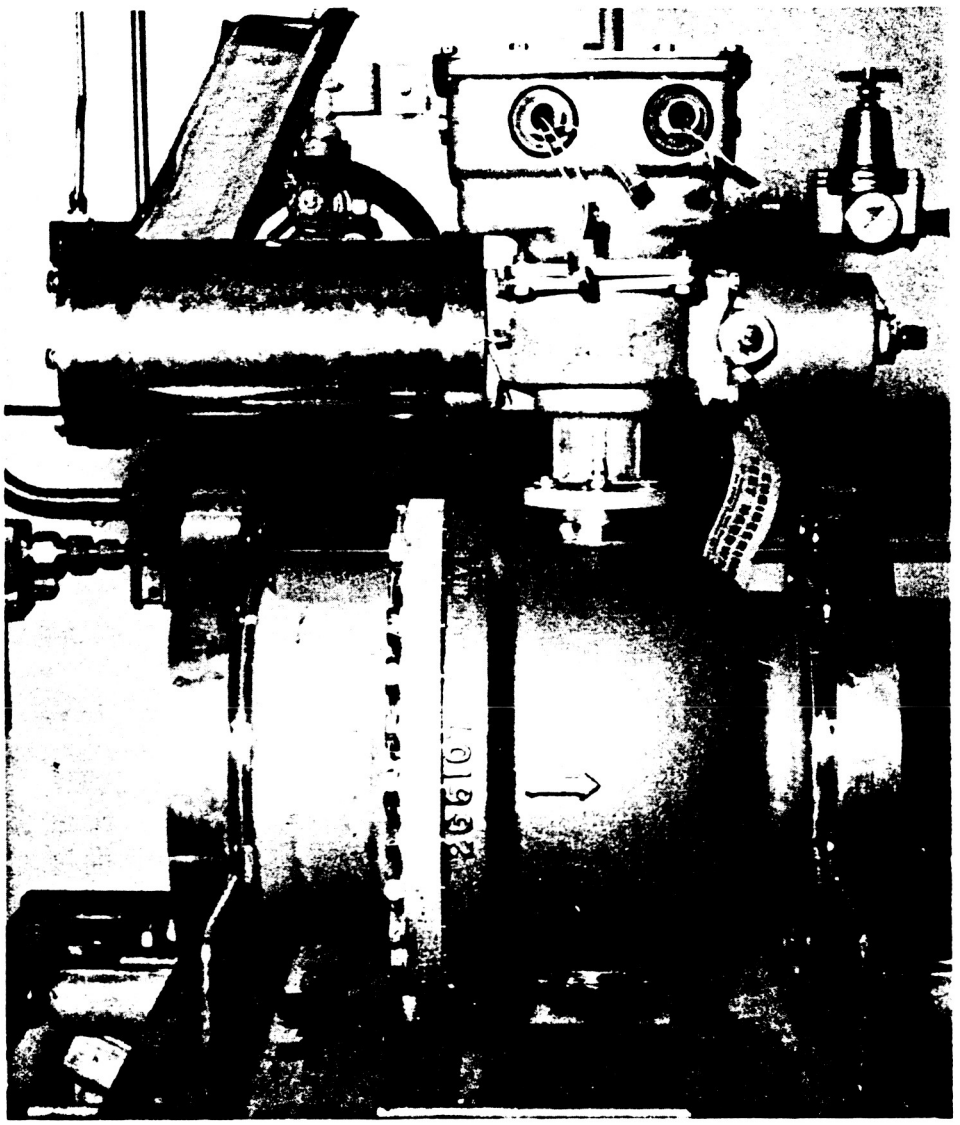


Figure 9-3. Specimen 2 After Burst Test

APPENDIX A

Determination of GN_2 Leakage Rates at Pressures Below 300 psig

DETERMINATION OF GN_2 LEAKAGE RATES AT PRESSURES BELOW 300 PSIG

1.1 TEST REQUIREMENTS

1.1.1 Seat leakage shall be measured at specimen inlet pressures from 25 to 300 psig.

1.1.2 The test medium shall be GN_2.

1.2 TEST PROCEDURE

1.2.1 The test specimen was installed as shown in figure 4-1.

1.2.2 The test specimen was closed by pressurizing the actuator to 750 psig.

1.2.3 The valve section of the specimen was pressurized from 25 to 300 psig in 25-psig increments. The specimen was checked for leakage at each of these pressures.

1.2.4 The test specimen pressure was reduced from 300 to 25 psig in 25-psig increments. The specimen was checked for leakage at each of these pressures.

1.3 TEST RESULTS

Leakage data recorded for specimen 2 indicated the pressure dependence of the valve seal. The specimen showed high leakage rates at low pressure and no leakage at pressures near 300 psig. Leakage data recorded for specimen 1 did not indicate any pressure dependence of the seal.

1.4 TEST DATA

1.4.1 The data presented in tables A-1 and A-2 were recorded during the leakage test.

Table A-1.

Leakage Data For Specimen 1

Increasing Pressure (psig)	Leakage (sccm)	Decreasing Pressure (psig)	Leakage (sccm)
25	16.4	300	0
50	49.2	275	0
75	49.2	250	0
100	65.6	225	0
125	82.0	200	0
150	98.4	175	0
175	114.8	150	0
200	131.2	125	0
225	131.2	100	0
250	131.2	75	0
275	114.8	50	0
300	82.0	25	37.7

Table A-2.

Leakage Data For Specimen 2

Increasing Pressure (psig)	Leakage (sccm)	Decreasing Pressure (psig)	Leakage (sccm)
25	2.5×10^4	300	0
50	3.1×10^4	275	0
75	2.5×10^4	250	0
100	8.4×10^3	225	0
125	2×10^3	200	0
150	32.8	175	0
175	0	150	0
200	0	125	0
225	0	100	41
250	0	75	2×10^3
275	0	50	6.6×10^3
300	0	25	9.9×10^3

APPROVAL

TEST REPORT

FOR

PNEUMATICALLY OPERATED SHUTOFF VALVE,

6-INCH, 300-PSIG

Parker Aircraft Company Part Number F914-2

NASA Drawing Number 75M13141 LSOV-1

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